NEW ZEALAND JOURNAL OF

Agriculture

FEBRUARY - 1956

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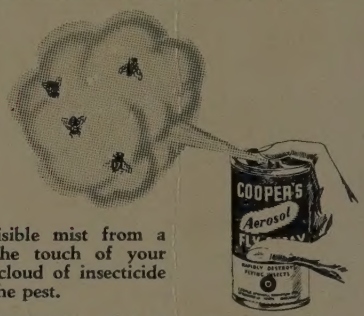

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This Month's Cover

Cherry picking at Alexandra, Central Otago, is the subject of this month's cover, which has been reproduced from a colour photograph by National Publicity Studios. Sweet cherry trees were first planted in Central Otago about 90 years ago and were a success from the start. Today the Alexandra and Roxburgh districts contain more than half of the cherry trees in commercial orchards and produce almost three-quarters of the cherries grown in New Zealand. In recent years air freight services have made much wider distribution of Central Otago cherries possible.

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Food and Agricultural Uses of Atomic Energy

ATOMIC energy is already making striking contributions to agriculture through the use in agricultural research of the radioactive by-products of atomic fission. These contributions include substantial improvements in the efficiency of producing, processing, and preserving food and other agricultural products. A resolution was adopted by the General Assembly of the United Nations in 1954 for international co-operation in developing the peaceful uses of atomic energy, and the Food and Agriculture Organization has now prepared a report on how atomic energy can be used to help alleviate hunger, poverty, and disease. This report was submitted to the United Nations Conference on the Peaceful Uses of Atomic Energy at Geneva in August 1955.

A SUMMARY of FAO's work in this field which follows outlines uses of atomic energy to increase production (the extracts are taken from an FAO Conference document suggesting that this subject be included in a number of proposed new activities of the organisation). Mention of work already in progress in New Zealand has been incorporated in the article.

Large scale industrial development of atomic power has not yet been applied to agriculture; rather it is the types of radiations and radioactive isotopes which have recently become more freely available as a by-product of nuclear reactions that are of prime importance to agriculture in the present and immediate future.

Uses of Radiations and Radioactive Isotopes

The applications of radiations and radioactive isotopes which constitute "positive" aspects may conveniently be considered under three headings:—

1. In agricultural processing and food technology.
2. In plant and animal breeding and pathology.
3. In agricultural and nutritional research.

"Negative" aspects such as problems of contamination, etc., are considered in a later part of this article.

"(a) The Uses of Radiations and Radioactive Isotopes in Agricultural Processing and Food Technology

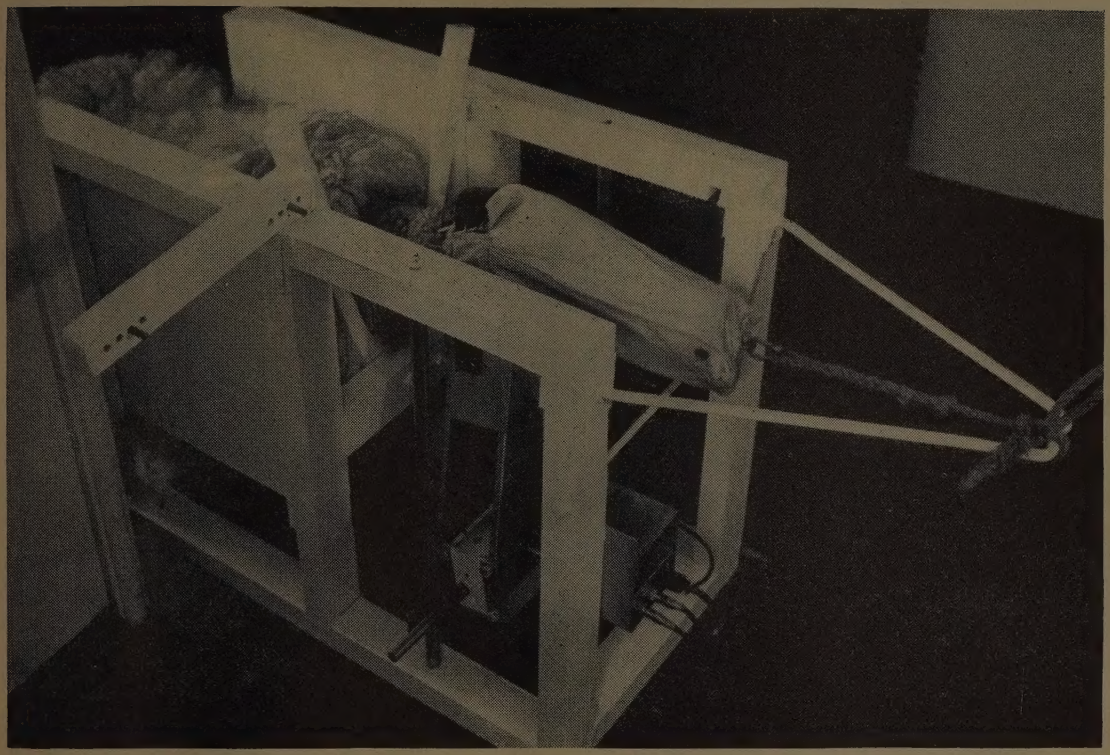
"Methods are being developed for preserving food through sterilisation by radiation at normal or low temperatures rather than through the application of heat. Although some difficulties such as undesirable side reactions, particularly flavour changes and sometimes destruction of vitamins and amino acids, are being encountered, it is quite possible that these methods will play a considerable role in food preservation. They are of potential interest not only for meat and fish preservation and marketing, but in the storage of bulk foods such as grains which are subject to pest infestation."

The possibility of atomic sterilisation of meat is of particular interest to New Zealand. It appears that the passing of beta or gamma rays through the meat kills bacteria and enzymes, thereby preserving the meat for 3 months or possibly 6 months or more. The success of this operation will save weight and space by obviating the need for refrigerating equipment, and more important still will open up new markets in places that do not have refrigeration facilities and are therefore at present unable to import a large quantity of meat.

The effect of sterilisation in preserving food is to alter the flavour of certain products. For instance, it has been found that there is little or no change in the flavour of chicken, pork, or bacon, a slight change in beef and lamb, and a considerable change in the flavour of milk and cheese. This can be overcome to a certain extent if radiation is applied to frozen meat or in the absence of oxygen.

The radiation of pork, which breaks the trichinosis cycle, is a related use which may open up new possibilities of

[*United States Information Service*



Measuring radioactive iodine in a sheep's thyroid at the Wallaceville Animal Research Station during investigations into goitre.

safeguarding for human consumption this and other products where similar problems are involved. (Trichinosis is the disease produced by the presence of calcified cysts in the muscles of the body. These are the larvae of the trichinae, parasitic worms which infest the muscles of pigs and are passed on to man by the eating of infested pork. The disease affects the muscles of the heart and also the brain and may cause death.)

There is also the possibility of using radiations in testing materials for strength properties, as in the location of so-called compression wood in timber.

As with all other uses of radiation, the possibility of dangerous side effects must be kept under constant review.

"(b) The Uses of Radiations and Radioactive Isotopes in Plant and Animal Breeding and Pathology

"It has been known for many years that radiations such as x-rays cause heritable mutations in plants and animals. With the advent of atomic energy further kinds of radiations and more potent sources have become readily available for experimental use, and several extensive programmes have been initiated for crop improvement through irradiation with a view to accelerating the normal rate of mutation and so increasing the variability available to the plant breeder for selection. Although, as in spontaneously appearing mutations, the vast majority are deleterious, desirable types occur in low proportion and have been selected in a wide variety of crops.

"Plants such as orchard crops which are normally propagated vegetatively are also receiving radiation treatment for the induction of bud mutations. Mutants have similarly been induced in algae and in this way types have been obtained which are adapted to high temperatures and thus more suitable for growth in mass culture. Such types may one day become an important source of food and industrial raw materials.

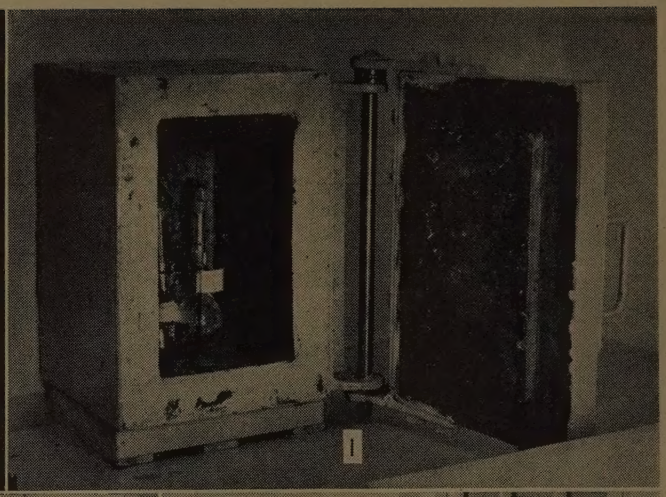
"There is already ample evidence to justify the conclusion that the application of radiation and radioactive isotopes in crop breeding constitutes one of the most important potential contributions of atomic science in agriculture. The principle of irradiation is equally applicable to the improvement of livestock, though its practical application is not as far advanced as with crops.

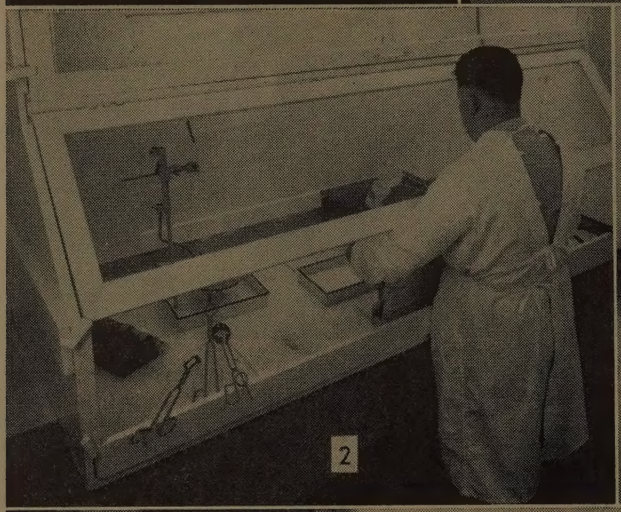
"Pathogens [the genes controlling susceptibility to disease] of both crops and livestock are likewise susceptible to mutation. Variants of reduced virulence developed by radiation may prove to be of value for use as vaccines in the production of immunity to commonly occurring more virulent forms of the pathogen, and irradiation may also be of help in developing polyvalent vaccines [mixed vaccines which give immunity against several diseases]. On the other hand the development of more virulent forms of pathogens is a possibility always to be borne in mind.

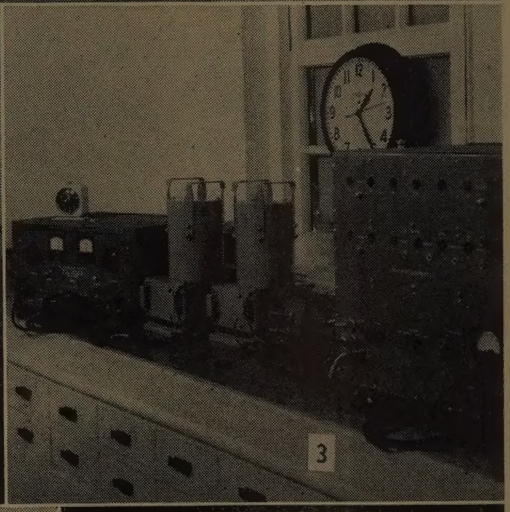
"(c) The Uses of Radiations and Radioactive Isotopes in Agricultural and Nutritional Research

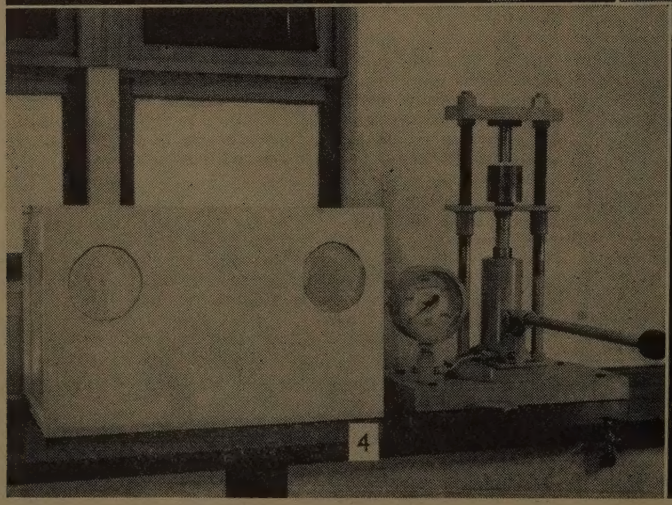
"The ready availability of radioactive isotopes of a large number of elements as a by-product of nuclear reactions has opened up the possibility of initiating a multitude of fundamental investigations which will lead to greater

Research with Radioactive Materials at Wallaceville









Equipment used in the radiochemical laboratory at the Department of Agriculture's Wallaceville Animal Research Station. 1—A lead safe for storage of radioactive isotopes. 2—A fume cupboard for work with radioactive isotopes. 3—Counting equipment. The Geiger-Muller counters are in the lead "castles" in the centre. 4—A "gloved box" for handling dangerous radioactive materials and a press for making briquettes from dried faeces or fodder for activity measurements.

efficiency in the production and utilisation of agricultural products through a better understanding of the processes involved. These so-called tracer studies are of value in a wide range of nutritional, metabolic, developmental, and pathological studies in plants, animals, and man, often giving information which at present could be obtained in no other way or only at much greater expense in terms of time and money."

In New Zealand the tracer technique has been used in most agricultural research centres to determine such questions as the degree of soil moisture and the use of phosphate and other minerals by plants and animals. One aspect of mineral nutrition is to measure the effect of brassicas and especially of white clover on the incidence of goitre.

Potential Contributions of Atomic Power

"The most promising method of utilising atomic energy as a source of power appears at present to be through its conversion into electricity. Though the future cost of atomic power in relation to conventional fuels is still uncertain, it should be a growing source of useful energy, particularly in locations where conventional fuel costs are high. The availability of more abundant and cheaper electric power would have a profound effect on agricultural production and rural welfare in general, both through the utilisation of that power in various production and processing operations and through the improvement of rural domestic amenities, and would be of particular significance in under-developed areas of the world."

For instance the development of nuclear power units suitable for ships would mean that fishing fleets could operate at greater distances from their bases and it has even been suggested that it would be possible to irrigate semi-arid and desert areas by large-scale de-salting of seawater.

Radiation Hazards and Contamination Problems

"The contamination of soil and water that may result from radioactive wastes and other causes is an important aspect of atomic energy development because of its possible effect on food and agricultural production. These problems of contamination constitute the 'negative' aspects of atomic energy."

The importance of these aspects arises from the fact that animal and plant organisms can concentrate certain radioactive elements if they are present in the environment. Unfortunately there is little information available at present on the effects of ingestion by other animals and particularly by man.

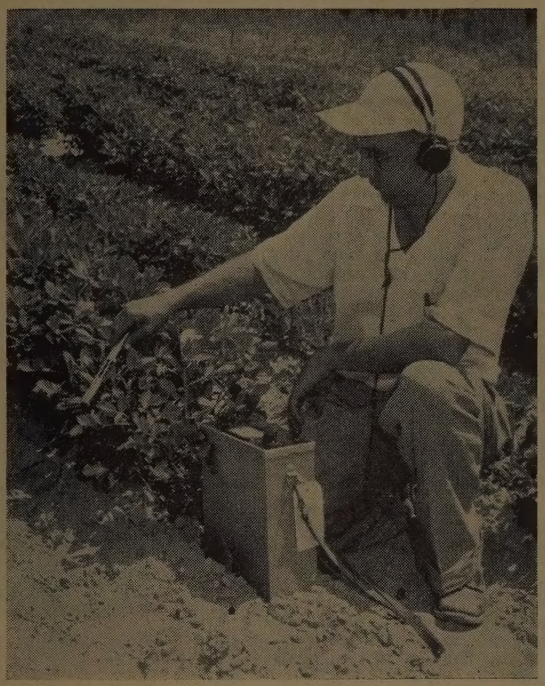
Need for Co-ordination by Users of Resources

The impact of atomic energy on other resources must also be considered. For example, water is necessary in the preparation of atomic energy and the problem arises of further allocating the limited water available to agriculture, industry, and domestic uses. A second vital resource needed for the production of atomic energy is adequate space. The location of atomic plants must be carefully planned, for it is necessary to have such plants situated away from large population centres and since their establishment is likely to be permanent, the site must be carefully chosen. In addition, methods of disposal are likely to have an effect on land and water resources, possibly with international implications such as in river pollution.

Role of FAO in Promoting International Co-operation in Peaceful Uses

Since it is FAO's function to raise nutritional levels by making methods of food production more efficient, it is imperative that all possible advantage be taken of the contribution to increased production that is possible from scientific and technical advances in other fields, such as in the field of atomic energy.

USE OF ATOMIC ENERGY



[*United States Information Service*

Isotopes are used as radioactive tracers in agriculture. Here a botanist determines how much fertiliser is being absorbed by plants. Minute quantities of isotopes had been mixed with the fertiliser. As the plants absorb the fertiliser the tracers can be detected in the stems and leaves with a Geiger counter.

To do this FAO must have close contact with national research programmes and this means co-ordination of projects between countries, the exchange and dissemination of technical information, the training of personnel, and acting as a general advisory body to guide national policies.

To this end the Director-General of FAO has proposed, in his Programme of Work and Budget for 1956 and 1957, to include, among certain other new activities, the study of the peaceful uses of atomic energy as they apply to food and agriculture. This matter was discussed at the Eighth Session of Conference, held at Rome in November 1955, at which New Zealand's Minister of Agriculture, Mr. Holyoake, was chairman. It is expected the subject will be included in the future work of FAO.

Information on techniques of applying atomic energy to agriculture, and particularly to agricultural research, is available to New Zealand scientists through the normal Commonwealth country channels such as the Commonwealth Agricultural Bureaux and overseas agricultural and genetic journals.

With the international co-operation envisaged through FAO agencies information on opportunities for the peaceful application of atomic power and by-products of nuclear reactions should be available to New Zealand as research in the atomic field continues.

Though the impact of the atomic age on New Zealand's agriculture to date has been only in the use in research of by-products of nuclear reactions, prospects of extension of the application of atomic science are an interesting field for conjecture.

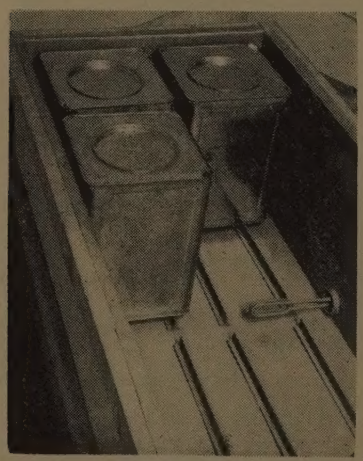
Melting Honey by Electric, Hot Water Method

THE commercial beekeeper who disposes of only a limited amount of his honey on the local market will find that sooner or later he will have to install some method of melting honey out of the 60lb. tins. In this article C. R. Paterson, Apiculturist, Department of Agriculture, Hamilton, describes a simple method of doing this without any fire hazard or risk of overheating the honey.

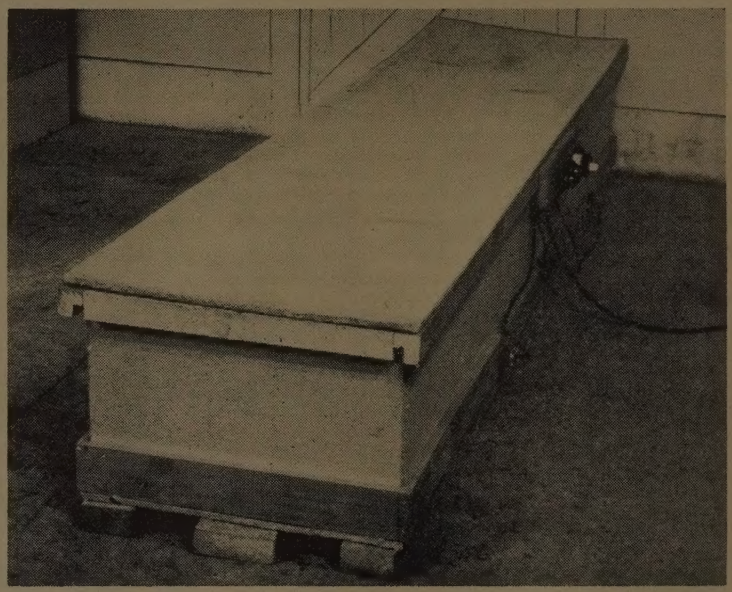
HOT water has been the medium used by beekeepers for melting honey for many years. Generally the source of heat has been a steam jet or a coal or wood fire. With either of these methods great difficulty has been experienced in maintaining a steady and safe water temperature. By use of electric heating elements the water temperature can be controlled to definite limits, thus overcoming the risk of any possibility of subjecting the honey to excessive heat.

Where water is used to melt honey there is always the possibility of the honey near the outside of the tin receiving too much heat. This is not so likely if the heating medium can be kept at a lower temperature. This, of course, means that the melting time is going to be extended, but the risk of any damage to the honey is overcome.

The holding tank is made of galvanised iron and is best made rectangular to keep the tins of honey in two rows. It has to be constructed to hold water. Four galvanised rails are placed on the bottom to keep the tins up about 1in. to 1½in. Two electric heating elements are fitted. These are controlled by a thermostat. The sides, top, and bottom are lined with wood-pulp wallboard to prevent heat loss.



Tins resting on the metal strips. One electric element has been screwed into position.



A view of the holding tank showing the insulating material and lid.

Details of Construction

Holding tank: This can be constructed of 22- or 24-gauge galvanised iron. All joins should be double seamed or lapped, riveted, and then soldered. Care should be taken in its construction to avoid the possibility of leaks developing after the insulating material has been put on. The size of this container to hold 20 tins should be 9ft. long by 21in. wide by 16in. deep.

Rails: Four rails to run the length of the holding tank are required. If some difficulty is experienced in securing these in iron, they can readily be made up out of galvanised iron by any sheet-metal worker with a bending machine. Iron rails should be sprayed with tin or zinc to prevent rusting of the tins.

Electric elements: Two 1000-watt elements are placed approximately 22in. from each end. The thermostat is placed in the centre. An electrician will be needed to wire these up.

Insulation: Wood-pulp wallboard is used to line the outside and bottom of the tank. The corners can have metal or wooden cover boards to protect the edges. The lid is a sheet of wood-pulp wallboard which rests evenly on the top. This should not be painted, as in its unpainted condition it appears to absorb any moisture that may form and prevent it settling on the tops of the tins.

Running the Unit

When the tins are placed in position a space of about 4in. must be left between the tins next to the heating elements. Sound tins are essential when hot water is used to melt honey, as even a small hole could mean the loss of quite a lot of honey.

The unit is filled with water almost to the top of the tins and heating is begun. After the honey has melted it will be found that the water level has dropped about an inch. This is due to the tins going back to their original shapes because of the pressure of the water round them.

The time taken to complete a melt will depend to a large extent on the general condition of the honey. To prevent any risk of overheating, the thermostat is set for approximately 120 degrees F. Usually in 24 hours the honey has melted completely. Temperature checks have shown that after this period the honey in all tins is at the same temperature. There is no reason why lower or higher temperature settings should not be tried.

Some form of wire handle that will slide under the tins should be used to lift them from the hot water.

This method of melting honey gives the beekeeper a chance to reduce hard honey into liquid condition for reprocessing without any attention during the melting period and without any fire hazards.

Control of Grasshoppers Damaging a Field Crop

By A. D. LOWE,
Entomological Research Station, Department of Scientific and Industrial Research, Ashburton

THOUGH one or two species of grasshoppers are commonly seen in pastures throughout New Zealand and some damage to crops has been observed, especially in Northland, such damage has not previously been recorded. Grasshoppers belong to the same family as locusts, well known in tropical areas for their swarming and damage to vegetation. They are also closely related to crickets. All these insects (order *Orthoptera*) have biting mouth parts and should not be confused with the cicada, an insect with sucking mouth parts and belonging to an entirely separate order (*Hemiptera*). Late in January 1955 an officer of the Department of Agriculture reported to the Entomological Research Station at Ashburton that grasshoppers were damaging a field of young Green Globe turnips on the property of Mr. J. Middleton, at Orton, and asked for suggestions as to control.

THE affected paddock lay on the south bank of the Rangitata River about 5 miles inland. The grasshopper involved was the "common dull brownish or yellowish grasshopper of rather small size" described by Tillyard (1926). This insect (*Phaulacridium marginale* Walk.) is well known in New Zealand, being seen throughout summer in dry areas. In Canterbury it is found in numbers in old browntop paddocks, along roadsides, and in many waste areas such as dry riverbeds. It is a relatively small insect, being 6/10in. to 7/10in. long, with short antennae, prominent eyes, and a pair of well-developed hind legs used for jumping. It proceeds in jumps of from 3ft. to 4ft. Tillyard records that "only about 1 per cent. of the males are ever fully winged, the females never".

In the infestation at Orton, though some thousands of the insects were seen and netted, none was taken with fully developed wings. A few of the adult insects had partly developed (vestigial) wings.

The grasshopper is one of those insects in which no true larval form occurs. The young—known as nymphs—hatch from eggs in the ground and are similar to the adults in appearance, though smaller. They moult several times during their life cycle. Up to the time they reach adult stage they appear to live a solitary existence, though hundreds may be present in particular places. Most insects of this family swarm at the time of mating and egg laying. In the winged types the swarms fly and frequently cause terrific damage, as in the well-known locust plagues.

These flights are followed by egg laying, in which the abdomen of the female is extruded into a hole in the ground and a number of eggs deposited, together with a glutinous substance which holds the eggs together in a mass in the soil. This process is repeated several times, the female of certain species depositing hundreds of eggs.

Grasshoppers generally are reckoned to have only one generation a year, with egg laying occurring in late summer or autumn. Though many species of this family have sound-producing organs, no evidence was gained of the production of sound by the insect involved in this infestation.

Infested Area

A general view of the area infested is shown in the illustration below. Young turnips, sown in mid-December, and making excellent growth, were completely consumed during the ravages of this insect. The old browntop areas adjoining the turnip crop sheltered large numbers of grasshoppers and are typical of the type of area in Canterbury where these insects are commonly seen. From this area the grasshoppers had gradually eaten their way into the crop.

The infested area, showing the margin of the paddock denuded of all growth and the type of old, dry pasture adjoining.

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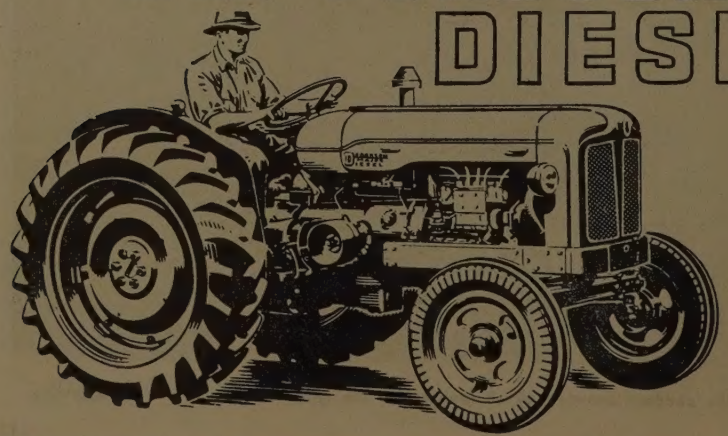

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From the fact that all vegetation, including weeds, in their path had been consumed, leaving only bare earth, it may be fairly assumed that they are universal feeders at this stage and were not especially interested in turnips. (Complete destruction of lucerne and rape seedlings in the same paddock in the current season by the insects supports this assumption.)

This point is noteworthy, as it probably means that in other circumstances any green crop adjoining this type of country might well be expected to be similarly damaged under suitable conditions.

Observations by both night and day in the area failed to reveal any other insect doing any damage to the crop.

As the Entomological Research Station staff was fully committed to other seasonal work, only a limited time was available to study this infestation. It was agreed, therefore, that as the farmer was interested mainly in control, a trial should be conducted with certain recommended chemicals. A mist sprayer-duster was available for the trials. This is a tractor-drawn machine (see lower illustration on this page) having its own petrol engine for the pumping of spray, agitation of dust hoppers, and the driving of a high-speed turbine fan. This fan drives the spray or dust out at right angles to the line of travel in a swath up to 40ft. wide. This swath width gives the advantage of limited travelling through the growing crop and thus the machine has some advantages over conventional boom sprayers.

Insecticides Compared

Laboratory experiments showed that lindane, aldrin, and DDT all killed this insect, though the last was somewhat slower than the first two. However, as DDT was considerably cheaper per pound of active ingredient, it was decided to include it in field trials. Ample water was available in the infested paddock and as no suitable dusts were available, spraying was chosen as the method most likely to give effective control. The materials used were: (1) A lindane wettable powder at ¼lb. of active ingredient per acre (cost £1 per acre); (2) an aldrin wettable powder at 4oz. of active ingredient per acre (cost 7s. per acre); (3) a DDT wettable powder at 1lb. para para isomer per acre (cost 11s. 6d. per acre).

The area was divided into 4 blocks of 4 acres each, 3 blocks being treated with the above materials and the fourth left untreated for comparison. It was felt that this procedure would give the maximum of information for future control with chemicals with the minimum of time and manpower expended. All materials were applied in 10 gallons of water per acre.

Insects and typical damage to leaf.

Counts were taken by a standard method of netting the grasshoppers from the foliage of the turnips over several areas in each treatment and in the untreated area. An interesting fact about these insects is that their appearance and jumping activity are controlled strictly by temperature. Activity begins at about 60 degrees F. and continues only while temperature remains above this level. Advent of cloud or cool winds reduces activity and the insects retire to the denser parts of the foliage. Hence counts of the insect had to be made as far as possible under reasonably identical conditions on each occasion.

Figures in Table 1 indicate that all insecticides gave reasonable control. Totals for insects netted are the aggregate of 20 sweeps with an insect net taken in each of 10 different areas on each treatment.

The mist sprayer-duster in action.

Warning

THE materials recommended in this article are highly toxic to honey bees and other beneficial pollinating insects. Though the treatment of non-flowering crops (pastures) as recommended in the article is not likely to have any serious harmful effect on these insects, operators must nevertheless exercise the utmost care to prevent spray (dust) drift on to neighbouring crops or pastures, particularly those in the flowering stage, or on to hives of honey bees in the vicinity of the area being treated. Before control measures on the lines indicated are undertaken the local instructor of the Extension Division of the Department of Agriculture should be consulted.

No portion of this article may be reproduced unless it is accompanied by the warning in the preceding paragraph.

TABLE 1—TOTAL GRASSHOPPERS TAKEN IN 200 SWEEPS OF NET

Days after treatment	DDT 1lb.	Lindane ½lb.	Aldrin 4oz.	Untreated
Day of treatment ..				101
3	12	1	0	78
10	11	4	1	105
28	4	2	0	14
47				8

The small black native cricket (*Lissotrachelus maoricus* Walk.) was also present in the field in considerable numbers, though it was not observed doing any damage. However, during the netting of grasshoppers counts were taken of this insect too, and these are shown in Table 2.

TABLE 2—NUMBER OF CRICKETS TAKEN IN 200 SWEEPS

Days after treatment	DDT 1lb.	Lindane ½lb.	Aldrin 4oz.	Untreated
3	7	0	0	15
10	13	15	0	13
28	1	1	0	2

The figures in Table 2, though small and incidental to the main experiment, seem to indicate that aldrin was giving more effective control of these insects, the total effect of the other two materials being left somewhat in doubt.

The figures in Table 1 indicate that, though DDT and lindane at the dosages used in the trial give reasonable control of the grasshopper, aldrin is the outstanding material for this purpose. At the dosage used in this work (4oz. per acre) it is by far the cheapest material of those chosen (7s. per acre).

The suppliers' recommendation of 2oz. per acre was viewed with reserve by those organising the experiment. However, since this work was carried out literature recording impartial overseas experiments has shown that use of this rate is now accepted practice against heavy infestations of locusts and grasshoppers. It is probable therefore that the rate used in the trial can be considerably reduced. At the 2oz. rate, cost for materials would be only 3s. 6d. per acre. The use of sprays represents a considerable advance in convenience over older methods of mixing and spreading baits for the control of this type of insect.

Figures in both tables give some indication of the trend of populations of the insects in this infestation. Though there is ample room for further work on the biology and field activity of the insects, sufficient knowledge has been gained to show that the grasshopper follows the general pattern of behaviour already established as characteristic of this insect family. Pending further work on this subject, the results recorded will provide sufficient guidance to give effective control with chemicals of any further outbreaks in field crops in New Zealand.

Reference

R. J. Tillyard: "Insects of Australia and New Zealand", p. 98, Angus and Robertson, 1926.

All photographs by Tindall.

Pedigree Sow Records

Contributed by the Animal Industry Division

In the period July to December 1955 the following breeders had litters recorded as shown:—

Owner's name and address	Herd book number: Sow	Herd book number: Sire	Number of pigs: Born	Number of pigs: Weaned	Litter weight: 3 weeks lb.	Litter weight: 8 weeks lb.	Litter grade*
Wessex Saddleback							
Clark, N. M. and F. S., R.D., Waimana	29	8	11	6	74	267	4
Berkshire							
I. R. Hunt, Oroua Downs, R.D., Foxton	29597	28787	11	10	113	342	2
I. R. Hunt, Oroua Downs, R.D., Foxton	27758	28218	11	9	111	350	2
Tamworth							
W. H. Jacobs, Stellbourne Pedigree Stud, Matai Ahaura P.O., Westland	17761	18538	11	9	141	296	2
W. H. Jacobs, Stellbourne Pedigree Stud, Matai Ahaura P.O., Westland	18591	18597	11	11	15	437	1
W. H. Jacobs, Stellbourne Pedigree Stud, Matai Ahaura P.O., Westland	17761	18597	10	9	140	339	2
W. H. Jacobs, Stellbourne Pedigree Stud, Matai Ahaura P.O., Westland	17448	18597	8	8	92	307	2
Large Black							
Thompson, R. H., Green Road, Kopane R.D., Palmerston North	6365	6406	13	9	146	377	1
Thompson, R. H., Green Road, Kopane R.D., Palmerston North	6398	6406	11	11	148	391	1
Large White							
Twyman, W. A. H., Ngakuru R.D., Rotorua	12736	12061	12	11	138	592	1
Twyman, W. A. H., Ngakuru R.D., Rotorua	12738	12061	14	7	127	443	1

Minimum Litter Weight for Grades

Grade*	3 weeks (lb.)	8 weeks (lb.)
1	120	360
2	100	300
3	90	270
4	80	240
5	70	210

Breed Averages for the Period under Review

Breed	Number of litters recorded	Number of pigs: Born	Number of pigs: Weaned	Litter weights: 3 weeks lb.	Litter weights: 8 weeks lb.	Average weight per pig: 3 weeks lb.	Average weight per pig: 8 weeks lb.
Wessex Saddleback ..	1	11	6	74	267	12.33	44.5
Berkshire ..	2	11	9.5	112	346	11.78	36.42
Tamworth ..	4	10	9.2	131	345	14.13	37.39
Large Black ..	2	12	10	147	384	15.47	40.42
Large White ..	2	13	9	132	517	14.72	57.5

* A No. 3 grade is classed as good, No. 2 as excellent, and No. 1 as special.

Hogget Rearing

By E. A. CLARKE, Senior Research Officer, and DAISY B. FILMER, Research Officer,
Department of Agriculture Ruakura Animal Research Station

THE problem of rearing good hoggets is not confined to New Zealand, but is one of world-wide importance. In New Zealand, however, there is a peculiar disease of hoggets which seldom occurs before late February-March and rarely persists later than early June. Its onset appears to be simultaneous with the new growth of pasture after the earlier autumn rains. Before this period hoggets grow well on almost any sort of pasture and after it they will fatten in paddocks where they previously failed to thrive. The disease is typified by the animals' inability to put on weight. Deaths may occur and the rate may exceed 15 per cent.

FOR the purpose of this discussion hogget ill thrift may be defined as a wasting disease of animals which develops in the midst of an apparent abundance of feed. The word apparent is stressed, for as yet quantitative measurements only of the food supply have been made. Qualitative analyses are envisaged in the future.

Hoggets, post-mortemed after dying or being killed in extremis, have presented a somewhat confused picture. They may be found to have severe anaemia, abnormalities of the bones, especially the ribs, fatty infiltration of the liver, and/or scanty gut contents, usually very fluid. In general this is a picture consistent with starvation. In addition various infections, both parasitic and bacterial, are usually present.

What Causes Ill Thrift?

The causes of the failure of some of these hoggets to thrive could be diagnosed and appropriate measures taken to ensure that further deaths were prevented.

For example, it had been known for a long time in New Zealand that certain soils were deficient in cobalt. Again, deficiencies of vitamins such as vitamin B_{12} or vitamin D may cause poor appetite or lack of development of bone tissue, tending to produce lack of thrift. In spite of treatment or elimination of both these types of deficiency diseases, ill thrift may still persist. Some bacterial and parasitic infections are also capable of rendering hoggets ill-thrifty. For example, a type of pneumonia tends to affect hoggets during autumn and this disease was very prevalent last year. In spite of treatment with antibiotics and also in the absence of this complication, however, hoggets may still fail to thrive. Here again pneumonia has not been a consistent finding in post-mortems. In fact the only consistent feature of all post-mortems on undrenched animals has been very heavy parasite burdens and typical starvation symptoms.

Role of Parasitism

At the beginning of investigations into this problem the actual role of parasitism in ill thrift had not been established. Most of the earlier work, therefore, was devoted to just this task. In this discussion the term "parasites" will refer to nematodes or roundworms which inhabit the gut of sheep.

From early results it became evident that two types of parasitism—primary and secondary—were being dealt with.

Primary parasitism was so called because it was found to be a prime cause in producing an ill-thrifty condition in sheep which very often led to death. It was a disease caused only by *Haemonchus contortus*, or the barber's pole worm, which derived its nutrients from the blood of the host. It produced a severe anaemia resulting in a rapid loss of body-weight. This parasite was found to be no respecter of age or condition. Severe cases of haemonchosis have been diagnosed in aged ewes and hoggets alike, whether in poor or fat condition, and have often resulted in death. Its occurrence was not always restricted to autumn, but outbreaks have been reported throughout the year when atmospheric humidity has been high. This disease was effectively treated by the immediate and repeated use of phenothiazine every 2 to 3 weeks. However, even after its elimination or in its absence hoggets have failed to thrive.

In Fig. 1 the growth-rate of a group of hoggets severely affected with haemonchosis is compared with that of hoggets from which the disease was eliminated by regular drenching with phenothiazine. These two groups of animals were grazed in different portions of the same paddock. The graph of the body-weights of the infected animals definitely reflects the effect of haemonchosis. It was found, however, that though regular fortnightly drenching with phenothiazine eliminated *Haemonchus* from the other group and produced a body-weight difference between groups of 5½lb., these hoggets did not thrive over autumn. They were, in fact, only 3lb. heavier on 13 April 1955 than they had been on 1 February 1955.

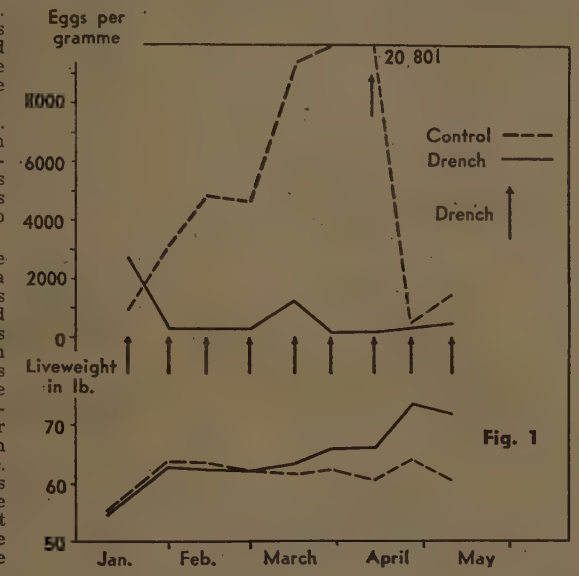

Fig. 1

Secondary parasitism, on the other hand, was found to be a disease which affected only hoggets rendered susceptible by some other predisposing factor such as this peculiar ill thrift. It was a disease caused by the non-bloodsucking worms such as *Trichostrongylus* sp. or the black scour worm. It affected young animals in poor condition only. Hoggets in good condition have been observed to withstand the effects of trichostrongylosis. For example, lambs graded prime at the works have harboured enormous burdens of 15,000 of these secondary parasites. To reduce the incidence of death from this cause during the ill-thrift period it has been found advantageous to drench tail-enders only three times at monthly intervals. Fortnightly drenching of other hoggets during autumn has produced no body-weight response. The body-weights of those animals have remained the same quite often for 3 to 4 months.

Fig. 2 illustrates this point. This work has been more fully reported in previous papers in the 14th Proceedings of the New Zealand Society of Animal Production Inc. and in the Proceedings of the Ruakura Farmers' Conference Week, 1954.

From these results it appeared that parasitism also might perhaps be

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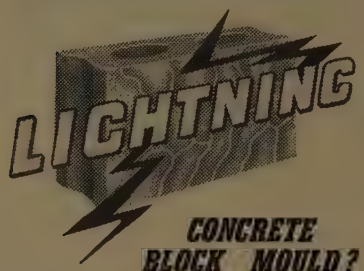

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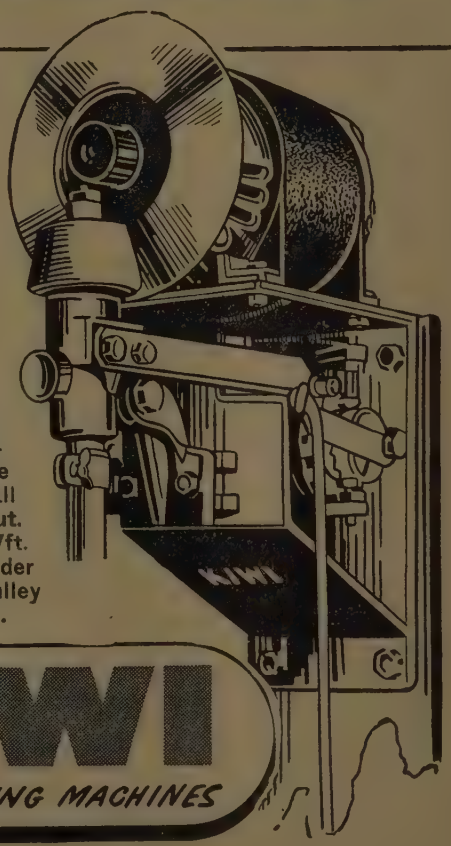

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relegated to a secondary position in the study of hogget ill thrift.

Though phenothiazine is regarded as the most efficient drug in controlling both primary and secondary parasitism, it is known to have two marked deficiencies:—

1. It is not effective in removing the entire population of parasites with perhaps the exception of *Haemonchus contortus.*
2. It has no lasting effect. Hence, the grazing animal can always carry a heavy burden of immature forms of parasites acquired in the intervals between drenchings.

It was argued, therefore, in view of these weaknesses that before parasitism could be relegated conclusively to a secondary position in hogget ill thrift, the following would have to be achieved:—

1. Ill thrift would have to be induced in worm-free grazing hoggets, or
2. Good hoggets would have to be reared over autumn in spite of harbouring heavy burdens of these secondary parasites.

Two trials were conducted last year which achieved these goals. The role of parasitism in hogget ill thrift has now definitely been established.

In the first trial worm-free lambs were reared indoors on an artificial diet and then introduced to a worm-free pasture. The animals were divided into two groups and the paddock into four blocks. The animals in one group were artificially infected with parasites other than *Haemonchus contortus.* The others were kept worm free for the duration of the trial.

Two blocks were allocated to each group and the animals rotated between their allotted blocks according to the condition of the pasture. In the period before rain at the beginning of autumn all hoggets grew well on uncontrolled, stemmy pasture. The paddocks were then topped and fresh pasture came away. From then onward, until the end of May, neither group of hoggets thrived. No difference between the body-weights of the two groups of hoggets could, however, be detected until the end of April, despite the heavy parasite burdens of the infested group. It was only after ill thrift had persisted for 4 weeks that parasitism manifested itself. The body-weight curves of the two groups then drew apart. The parasitised animals lost an average of 5½lb. and the worm-free ones 2lb. over 2 months.

On the other hand in the second trial good hoggets were reared on a cattle farm on long, mature pasture during autumn, despite their harbouring worm burdens as heavy as those carried by the infested group in the previous trial.

The results of these two trials and of many others indicate that:—

1. These secondary parasites become a problem only when hoggets are ill-thrifty from some other cause.

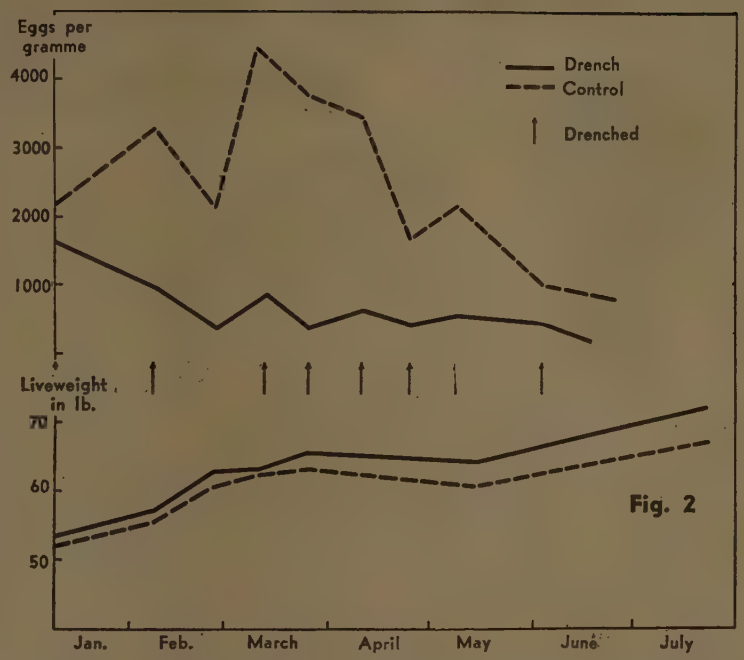

Fig. 2

2. Parasitism is not the cause of this peculiar ill thrift of hoggets.

Role of Pasture

Parasitism having thus been eliminated also as a cause of ill thrift, attention was turned to the nutrition of the hogget. Investigations into the food of the animal (pasture) are now being conducted. It is yet too early to predict which factor in pasture may be the source of ill thrift. Results to date suggest that the fresh growth of pasture produced in autumn after the first rains is in some way incompatible with the production of good growth in hoggets. The most striking example of this to date was the result obtained in the trial using worm-free hoggets. It will be remembered that the hoggets slipped in condition when offered fresh autumn pasture. While the long, mature pasture was being grazed the average growth rate was 3lb. to 4lb. per week.

When they were introduced to the fresh autumn pasture, however, all hoggets failed to thrive.

That this ability to produce ill thrift is a feature of autumn pastures alone

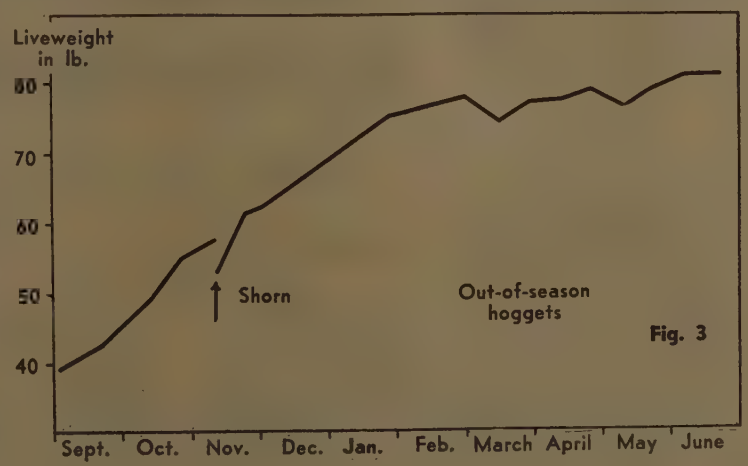

Fig. 3

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FATTENING LAMBS	LAMBS AFTER 10 WEEKS
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and not of the spring flush was illustrated in another trial last year. In September some out-of-season lambs were weaned at 12 weeks of age on to an area which has produced ill-thrifty hoggets during the past three autumns. The area was managed in such a way as to produce all stages of growth in the pasture over spring and summer. It was topped and allowed to come away after rain to produce a fresh growth of pasture similar to that so typical of autumn.

Fig. 3 shows that at no time during spring and summer was the growth of these hoggets affected. However, with the advent of autumn these animals lost weight to a degree similar to that of young hoggets grazing the same area.

Two interesting observations arose, therefore, out of this trial:—

1. Ill thrift was found to be a disease confined to autumn and did not occur in spring, though pasture response to rain appeared visually to be similar.
2. Loss of weight in autumn can occur in older animals as well as in hoggets. This decrease in growth-rate has also been observed in 2-tooth wethers and ewes of varying ages.

In all trials, however, where pasture has been of a long, mature type during autumn good hoggets have been successfully reared. Food intakes have been up to 30 per cent. more on long pasture than on short pasture. This would suggest that palatability is a factor worth investigation. This superiority of mature pasture was demonstrated both with a mixed sward and a pure white clover sward.

In Fig. 4 the body-weight of hoggets reared on long, mature sheep farm pasture of mixed type is compared with that of hoggets run on a dairy farm. Earlier work has shown that hoggets can always be brought through autumn in good condition if grazed on dairy farm pastures. It will be seen that both curves are very similar, both showing an upward trend during autumn. On the other hand the growth-rate of hoggets grazed on fresh autumn pasture compares very poorly.

Excellent hoggets also have been reared on mature white clover both at the Department of Agriculture's Manutuke Research Station, Poverty Bay, and at the Department's Ruakura Hill Station, Waikato.

In Fig. 5 the growth-rate of hoggets reared at the Manutuke Research Station on a mature white clover sward is compared with that of animals grazing perennial ryegrass. At the end of 3 months the difference between the average body-weights of the groups was approximately 20lb. Feeding of these materials in dried form to penned animals has produced a similar result. The amount of clover eaten compared with ryegrass was in the ratio of 3 : 2.

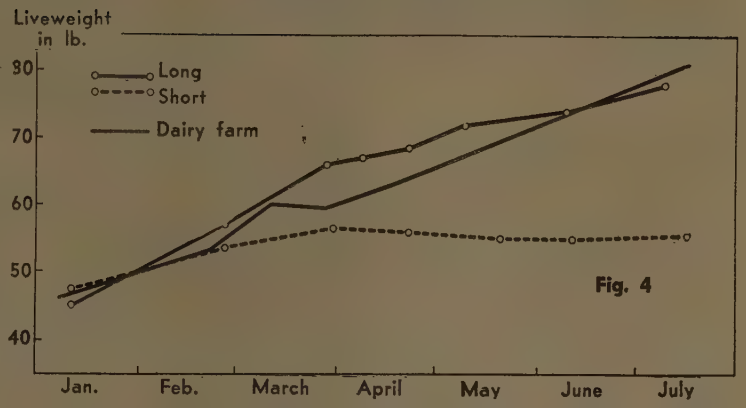


Fig. 4

On the other hand hoggets have been observed refusing to eat immature white clover. A pure sward of clover was sown at Ruakura during autumn in 1954. When it was 2 weeks old it was offered to a group of hoggets. These animals would not touch the clover and showed a definite preference for the "rubbish" growing on the headlands. That palatability in this case was a factor is a possibility.

Further studies on the palatability, intakes, and digestibilities of various pasture types at different stages of growth and maturity have been planned.

Though results clearly indicate the superiority of mature pastures with a dominance of white clover, the difficulty of producing this in some seasons and in many districts is appreciated.

On hill country, for example, pure white clover swards are difficult to maintain, the best results usually being obtained in the first year of sowing. In certain areas of high soil fertility and in isolated pockets on farms, however, mature white clover may well prove to be a successful proposition. Again, in some seasons it may be extremely difficult to produce mature feed of any variety. If the practice of early weaning of lambs is adopted, larger areas could be spelled for longer periods, thus allowing the pasture to mature before autumn.

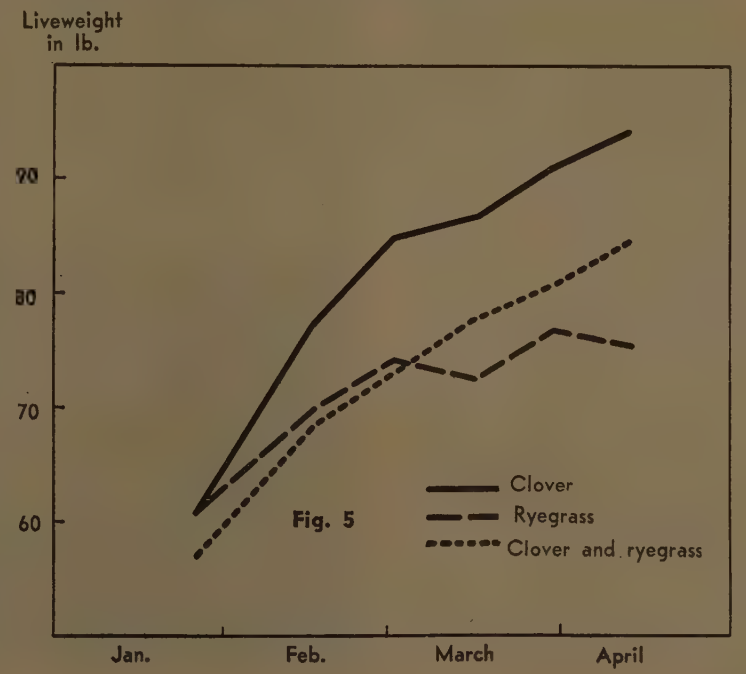


Fig. 5

HOGGET REARING . . .

Suggestions, based on successful field trials, for reducing the incidence of this peculiar ill thrift, then, would be:—

1. To provide hoggets with:
   (a) Mature pasture 6in. to 8in. long such as is found under a system of extensive grazing where the hoggets are unable to control the feed; or
   (b) A controlled but long and mature pasture such as is found on a dairy or cattle farm; or
   (c) A sward of mature pure white clover if soil fertility and type of farming permit.
2. To shift hoggets to a spelled paddock of feed as mature as possible immediately their growth-rate slackens, as there is evidence of paddock variability.
3. To control parasitism by the strategic use of phenothiazine; that is,
   (a) To drench tail-enders only three times during autumn at monthly intervals to reduce deaths from secondary parasitism.
   (b) To endeavour to anticipate an outbreak of haemonchosis or primary parasitism and to drench all animals in the flock immediately and at 2 to 3 weekly intervals thereafter until disease has been eradicated.
4. To treat all known deficiency diseases in areas where these occur.

Summary

1. Loss of weight on autumn pasture is not confined to hoggets, but has been demonstrated in older sheep also. In the young and growing hogget, however, this loss of weight manifests itself strikingly in the condition termed "hogget ill thrift".

2. Its manifestations are confined to autumn.

3. It occurs in the presence of an apparent abundance of feed.

4. Its onset is concurrent with the production of fresh growth of pasture.

5. It is not caused by any known infections, either parasitic or bacterial, nor by deficiencies of minerals or vitamins known at present.

6. Mortalities from parasitism may be reduced by the strategic use of phenothiazine in controlling secondary parasitism in tail-enders and eradicating haemonchosis from the whole flock.

7. Its incidence may be reduced by providing hoggets with mature pasture containing, where possible, a proportion of white clover.

Device for Freeing Bogged Tractors

MR. O. L. BYERS, a Dargaville farmer, has fitted a device to his tractor for extricating the tractor when it becomes bogged down. This attachment should appeal to farmers on swampy country, who would probably find frequent use for it. It consists of an old discarded truck wheel rim with an off-centre hub plate which is drilled to accommodate the standard hub fitments of the tractor it is to be attached to. This rim is fitted to the hub inside the driving wheel and the wheel is fastened outside it to hold it in position. The rim then becomes a winch drum which will accommodate about 80ft. of 7/16in. wire rope.

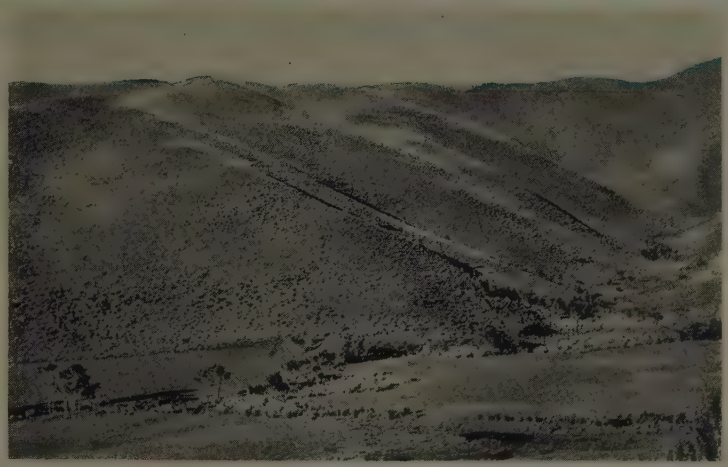
When the tractor becomes bogged the wire is run out and fastened to an anchor such as a post or tree or a deadman set in the ground. When the tractor is started it is only necessary to engage low gear and brake the wheel opposite to the winch drum for the tractor to winch itself out. The illustrations show the device and the method of attaching it to the tractor.

Above left—The device drilled and ready for attaching to the hub of the tractor. Above right—The device fitted inside the wheel of the tractor. Below—The device fitted to the tractor hub before the wheel is bolted on.

Aerial Topdressing and Oversowing Bring

Hill Country Improvement in Marlborough

IN Marlborough, as in other parts of New Zealand, hill country farmers have been making increasing use of the aeroplane to topdress and oversow hill areas. In this article W. R. Crawford, Fields Instructor, Department of Agriculture, Blenheim, gives some of the production increases which a Marlborough hill country farmer has obtained largely as a result of using the aeroplane to spread fertiliser and seed.



Some of the Marlborough hill country which has been topdressed and oversown from the air.

THE property is on the south side of the Wairau River and is about 30 miles from Blenheim on the Blenheim-West Coast highway. Of the total area of 1740 acres approximately 180 acres are flat, ploughable country that carries good pasture and on which 25 acres of turnips are grown each year for supplementary feed. The remaining 1560 acres are hilly country varying from easy rolling to steep hills and the altitude ranges from 600ft. to 3400ft. above sea level.

The soil on the hill area is classed as Haldon stony silt loam, which is a dark greyish-brown stony silt loam with a soft crumb structure. Lime is not required, but the application of phosphate is beneficial. The unimproved pastures consist of silver tussock, sweet vernal, and browntop, and they tend to revert to matagouri on the sunny faces and to fern on the shady faces. On parts of the lower hill country there is some natural white clover.

When the present owner, Mr. E. Scherp, took over in the 1942-43 season the number of sheep shorn was about 1170. The property was understocked, however, and the sheep numbers were built up until 1500 were shorn in the 1949-50 season. Mr. Scherp considered that this was the maximum number of sheep he could carry without overstocking to the detriment of existing pastures.

It was obvious that if further increases were to be achieved, methods other than stock management would have to be applied. In the 1949-50 season it was therefore decided to topdress a hill block of 160 acres with superphosphate from the air, this being one of the first aerial topdressing jobs done in Marlborough. No seed was spread at that time. The cover on the block was predominantly browntop and danthonia with a little natural white clover and there were many areas of bare ground. The white clover, which had not thrived previously, responded rapidly to the topdressing, and Mr. Scherp decided to embark on a definite aerial topdressing and oversowing programme.

In January 1951 the whole farm was topdressed from the air with 100 tons of superphosphate, and this was followed by the aerial oversowing of 2lb. of subterranean clover per acre. A good strike of subterranean clover was obtained together with increased vigour of the white clover already in the sward. Since 1951 the whole farm except for 400 or 500 acres of the highest country has been topdressed and oversown each year, the clover and grass seed being sown with the fertiliser. Table 1 shows the programme that has been adopted.

TABLE 1—TOPDRESSING AND OVERSOWING PROGRAMME

January 1951	100 tons of superphosphate followed by 2lb. per acre of subterranean clover.
January 1952	80 tons of superphosphate with 2lb. per acre of subterranean clover.
January 1953	80 tons of superphosphate with 3lb. per acre of cocksfoot.
January 1954	95 tons of superphosphate with 3lb. per acre of cocksfoot.
January 1955	130 tons of superphosphate with 3lb. per acre of cowgrass.

The sowing in 1955 was over the whole farm, including the highest country.

No white clover has yet been sown, but it is intended to oversow the high wether block with white clover this year. Where previously bare ground was common and only low-fertility grasses such as danthonia and sweet vernal were able to survive among the tussock, vigorous subterranean clover, white clover, and cocksfoot are now established.

The stock carried consists of 2300 Corriedales and 20 cattle and during the 1954-55 season 2047 sheep were shorn, compared with 1500 in 1949-50. Most of the increase has taken place on the lower hill country, which in conjunction with the 180 acres of flat land, used mainly as holding paddocks, is now carrying approximately 2½ sheep per acre. The higher and more difficult country of nearly 900 acres is carrying 400 wethers, or less than ½ dry sheep per acre, but Mr. Scherp believes that this country can be greatly improved with further topdressing and oversowing.

Table 2 shows the increase in production which has taken place, a great part of which can be attributed to the aerial oversowing and topdressing programme. Since 1951 all the increase can be attributed to oversowing and topdressing from the air.

TABLE 2—PRODUCTION INCREASES

Seasons	Average total weight of wool lb.	Average no. of sheep shorn	Average fleece weight lb.
1942-43 to 1944-45	9,630	1,222	7.9
1945-46 to 1949-50	13,410	1,445	9.3
*1950-51 to 1954-55	18,250	1,772	10.3

* Aerial topdressing and oversowing began in this period.

Proof that this method of improving this type of hill country is successful and profitable can be seen from the fact that Mr. Scherp will continue to use aircraft to topdress his property at the rate of 1¼cwt. of superphosphate per annum and will oversow the higher and steeper country with white clover in the near future. There are considerable areas of somewhat similar country in Marlborough, and the results achieved by Mr. Scherp are an indication of what may be expected from some of this hill country by oversowing and topdressing with aircraft.

Improving Fescue Tussock Grassland in the Mackenzie Country

MORE attention is being paid to high country grassland problems of the Mackenzie Country and earnest attempts are being made to arrest the general deterioration that has been taking place since the 1860s. Regrassing trials being carried out in the region and some results to date are described in this article by H. M. Sievwright, Fields Instructor, Department of Agriculture, Tekapo.

SOUTH CANTERBURY possesses some 1,900,000 acres of hard tussock (*Festuca novae-zelandiae*) country, the greater part of which lies within the Mackenzie Country at altitudes ranging from 1500ft. to 3000ft. Over much of this area rabbits have reduced the ground cover to leave scabweed and bare ground or aggressive, low-producing exotics like browntop (*Agrostis tenuis*), sweet vernal (*Anthoxanthum odoratum*), and sorrel (*Rumex acetosella*).

Climate

Annual rainfall throughout the area varies from some 70in. in the gorges and near the main divide to under 11in. in the south-eastern sector near the Waitaki River. At high altitudes and in proximity to the encircling mountain ranges winters are prolonged and severe, with 30 degree frosts and snowfalls to a depth of 2ft. to 2ft. 6in. not uncommon. Consequently the growing season is comparatively short (mid-October to mid-April), and high summer temperatures (up to 90 degrees), together with low summer rainfall and strong, desiccating north-west winds, also cause a lowering of production.

Interest in Improvement

Though much of the country is ploughable (or at least negotiable by implements) and much of the soil is light and deep, the altitude, climate, incidence of rabbits, and the vast size and natural low carrying capacity of the areas concerned did not encourage any large-scale attempts at improvement until comparatively recent times.

Quite apart from the more widespread realisation that the tussock grasslands as a whole are in need of improvements, a number of recent developments have stimulated action. Foremost among these have been the recent period of high wool prices, the control of the rabbit pest under "killer" policy, and the development of aerial aids to farming and of special equipment permitting subsurface introduction of seeds and fertiliser without loss of soil consolidation.

The greater part of the fescue tussock in South Canterbury lies in the Mackenzie Country at altitudes from 1500ft. to 3000ft.

Legumes in the High Country

One other factor that has encouraged large-scale improvement of the ground cover and grazing potentialities of high country tussock swards is the realisation that clovers, which have done so much in pioneering development and in promoting persistent, high-producing grazing swards on other classes of country, will serve a similar purpose in tussock country. The native tussock grasslands of alpine and sub-alpine regions have always been devoid of legumes with the exception of a meagre population of native brooms (*Carmichaelia* species), most of which are browsed out under normal grazing practices.

The soils in these areas are very low in available nitrogen, which is so essential to the welfare of grass growth and worthwhile herbage production. The introduction of clovers offers the most practical and economic means of providing this nitrogen and at the same time provides palatable herbage to improve immediately the feeding value of high country swards.

Interest in the possibilities of improving fescue tussock swards by introducing clovers is gaining impetus,

Improving Tussock Grassland in Mackenzie Country

The tussock grasslands of alpine and sub-alpine regions are devoid of legumes and their soils are very low in available nitrogen.

Clovers can be established readily and be both persistent and productive in the Mackenzie Country.

Lucerne (12lb. per acre) in foreground and cowgrass (6lb.) in distance at right 14 months after being drilled. The area was not grazed. →

Cowgrass (6lb. per acre) at left and Montgomery red clover (6lb.) at right 14 months after being drilled.

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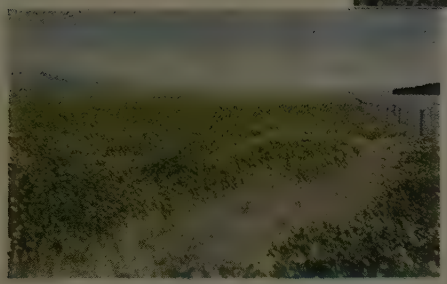
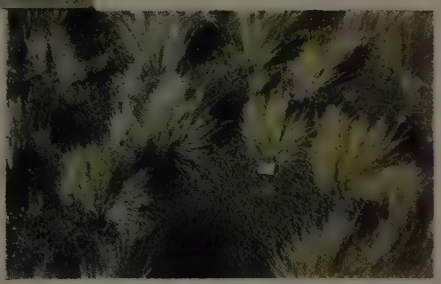


This trial exceeded all expectations and, though the grasses were slow to start, all sown species are established in the sward.



A very healthy stand of fescue tussock with a close sward of clover and native species. This is part of 200 acres on a station which has been improved by drilling in legumes.

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even though there may be some doubts as to the ultimate outcome of this practice and some apprehension about the possibility of maintaining the improvement should any future fall in station incomes cause the abandonment of regular applications of fertiliser.

→ Winters are prolonged and severe, with frosts of 30 degrees F. and snowfalls to a depth of 2ft. 6in.

IMPROVING FESCUE TUSSOCK GRASSLAND

The Holbrook Trials

That clovers can be established readily and be persistent and productive in the hard tussock grasslands of the Mackenzie Country has been amply demonstrated by the Department's Holbrook trials, begun in the spring of 1948. Before these trials began experimental research in the area had been very intermittent and confined mainly to an endeavour to find, from overseas plant introductions, grass species capable of improving tussock swards. These earlier trials demonstrated the difficulties associated with grass introductions in the severe and often arid environments, though the Haldon plots, laid down in 1910, proved that tall oat grass (*Arrhenatherum elatius*) would establish and persist, as would also one useful member of the *Rosaceae* family, sheep's burnet (*Poterium sanguisorba*).

Location

The Holbrook area is located on the exposed Sawdon Flat adjacent to Burke's Pass on the Tekapo highway some 6 miles south-east of Lake Tekapo. Soil type, altitude (2200ft.), and original ground cover are all typical of much of the flat land in the Mackenzie Country. Ground cover existing when the trials began consisted of approximately 20 per cent. of tussocks (nine-tenths fescue tussock and one-tenth blue tussock (*Poa colensoi*)), 10 per cent. each of sweet vernal and chewings fescue (*Festuca rubra* var. *fallax*), and a sparse population of native herbs with such other species as sorrel, catsear (*Hypochaeris radicata*), feather brome (*Bromus tectorum*), and blue wheat grass (*Agropyron scabrum*). There was 20 per cent. to 40 per cent. of bare ground. The annual rainfall on Sawdon Flat is about 18in.

Original Sowings

All trials in the Holbrook area have been established without cultivation, except for some tripod harrowing done before drilling of the original trial. The main object of the trials has been to determine the possibilities of improving the tussock grasslands, without disturbing the native vegetative cover or losing consolidation, by introducing various pasture species, particularly legumes. Seeds mixtures of grasses and clovers were introduced by two methods: (a) Ordinary surface broadcasting and (b) subsurface drilling of seed and fertiliser by the then recently introduced grassland tips fitted to orthodox coulters on a conventional grain drill.

In one section of the 1948 trials a general seeds mixture of crested wheat grass (*Agropyron cristatum*), lucerne (*Medicago sativa*), sweet clover (*Melilotus alba*), subterranean clover (*Trifolium subterraneum*), *Lotus* species, sainfoin (*Onbrychis sativa*), sheep's burnet, and chicory (*Cichorium intybus*) was sown at 20½lb. per acre, both broadcast and with grassland tips after tripod harrowing. A mixture of equal parts of superphosphate and lime was applied at 2cwt. per acre at the time of sowing.

In addition a further series of 21 drilled plots included one of the general mixture and 12 plots of crested wheat grass plus one or another of the following legumes: sainfoin (Cotswold and Giant strains), strawberry clover (*Trifolium fragiferum*), *Lotus corniculatus* (2 strains), lucerne, sweet clover, subterranean clover (Tallarook and Mt. Barker strains), and Kentish wild white clover. Sheep's burnet was also sown in one of the crested wheat grass plots.

The remaining 10 plots included 10 grass species sown with a basic mixture of crested dogstail, lucerne, sweet clover, and subterranean clover. The grasses included intermediate wheat grass (*Agropyron intermedium*), perennial veldt grass (*Ehrharta calycina*), crested dogstail (*Cynosurus cristatus*), *Bromus carinatus*, chewings fescue, tall oat grass, browntop *Phalaris tuberosa*, and cocksfoot (*Dactylis glomerata*). Fertiliser was the same as for the block sowing of the general mixture.

Of the sown grasses the two *Agropyron* species and crested and intermediate wheat grasses are of importance in the range country of Canada. Perennial veldt grass is of South African origin and *Bromus carinatus* is another North American range grass not unlike the more familiar prairie grass (*Bromus catharticus*). Of the legumes sweet clover has a high reputation in the United States and the sainfoins are fairly extensively grown in Europe and America.

A portion of each plot was sown outside the rabbit-proof enclosure surrounding the major portion of the trial. On this unprotected section none of the species was able to establish. Within the enclosure most of the legumes, except the *Lotus* species, established very well. Grasses, on the other hand, came away very slowly.

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the most successful being cocksfoot and crested wheat grass.

When observed in November 1949, some 12 months after sowing, the most outstanding features of the trials were:—

The extraordinary growth of legumes, including seed impurity introductions of alsike (*Trifolium hybridum*), red clover, white clover, and suckling clover.

The comparatively poor and slow establishment of most of the grasses.

The much better establishment of sown species, particularly the legumes, in the grassland tip drilled plots than where seed was surface broadcast.

Further Trials

Results achieved with the initial trials encouraged further experimental work. Consequently, a species and strains trial and an extensive grazing area were laid down in October 1951.

This trial included white clover (pedigree strain), Kentish wild white clover, alsike, Montgomery red clover and cowgrass, sweet clover, and lucerne. Grass species included cocksfoot, tall oat grass, tall fescue (*Festuca arundinacea*), *Phalaris tuberosa*, Yorkshire fog (*Holcus lanatus*), sweet vernal, and crested dogstail. *Poa pratensis*, sheep's burnet, and yarrow (*Achillea millefolium*) were also included in two of the mixtures.

All the legumes and tall oat grass and tall fescue were sown in separate plots as pure sowings as well as being included in grass-legume mixtures. The latter mixtures also included lucerne in combination with cocksfoot, *Phalaris tuberosa*, or white clover.

The seed and fertiliser were drilled with grassland tips without any prior cultivation.

As in the 1948 sowings the legumes were markedly superior to grasses in ease of establishment, and in the initial stages their order of merit was white clover (pedigree strain), cowgrass, lucerne, alsike, and Montgomery red clover. Subsequently, lucerne improved its relative position, as also did Montgomery red clover. Alsike also continued to produce well, but cowgrass has diminished and sweet clover soon disappeared in this trial.

Of the grasses cocksfoot proved the best and is well established, especially where sown in association with lucerne, this combination proving one of the best throughout the trials.

Grazing Area

The grazing trial consists of 8½ acres. Of this 6½ acres were drilled with cocksfoot (3lb.), tall oat grass (3lb.), tall fescue (1½lb.), *Danthonia pilosa* (1lb.), white clover (pedigree strain) (2lb.), alsike (2lb.), Montgomery red clover (3lb.), Tallarook subterranean clover (2lb.), and suckling clover (1lb.), a total of 18½lb. per acre.

A further 1 acre sown with the above mixture also included lucerne (6lb.), and the remaining acre had 2lb. of sweet clover added to the original mixture.

Fertiliser applied at sowing was a 3 : 1 mixture of reverted superphosphate and lime at 2cwt. per acre.

Establishment on this trial exceeded all expectations and though the grasses were slow to come away, all sown grass species are now established in the sward. Sweet clover established sparsely and subterranean and suckling clovers were smothered out under the canopy of more vigorous and taller growing species. Pedigree white clover, alsike, and lucerne have proved very productive and Montgomery red clover has become well established and is producing satisfactorily.

Cocksfoot is the only grass to become at all strongly established, though both tall oat grass and tall fescue appear conspicuously throughout the area.

Grazing Practice

Owing to problems associated with lack of water, breed of sheep, and the comparatively small trial area, regular grazings on these trials have not been possible. Consequently, mob stocking for short periods, as distinct from more or less set grazings, has been employed.

The total area was grazed in March, May, July, and November of 1953 and June, August, September, and October of 1954. Rates of stocking varied from approximately 27 sheep per acre for 14 days (March 1953) to 2 sheep per acre for 12 days (October 1954). It was found possible, particularly during the first year (1953), to graze on the area at the equivalent of 2½ sheep per acre for the hard winter months of May to August, and it is especially for early and mid-winter grazings that runholders are continuing to improve their winter blocks by legume introductions.

Practical Application of Results

Encouraged by evidence obtained on the Holbrook trials, runholders in South Canterbury have drilled with grassland tips some 1200 acres during the past 4 years. Where these were spelled from grazing for 3 months after drilling good results have been achieved.

Drilling is done in spring as soon as possible after the heavy frost period. Runholders who have adopted this practice are satisfied with the results of drilling seed and superphosphate together in a firm coulter mark just below ground surface as is obtained by the use of grassland tips.

Conclusions

As a result of the Holbrook trials, which have extended over 7 seasons, the following conclusions applying to the hard fescue tussock grasslands of the Mackenzie Country may be drawn:—

1. Such commonly used legumes as white and red clover, alsike, and lucerne can be readily established and prove persistent and productive.

2. Subsurface drilling of seed and fertiliser with grassland tip coulters leads to quicker and more even establishment of sown species than surface broadcasting.

3. The introduction of grass species, with the possible exception of cocksfoot and tall oat grass, is difficult to achieve in the initial seeding even where seed is drilled. Cocksfoot has proved the most successful to establish in worthwhile quantities. Tall oat grass and tall fescue have met with some success, and crested wheat grass and sheep's burnet have established in bare, wind-blown areas, but make very little growth.

4. The sowing of grasses alone is not satisfactory, as they thrive only in association with vigorous legumes.

5. Sown areas should be spelled for 4 months after drilling and then only lightly grazed for the remainder of the first season. Subsequent grazings should be such as to prevent smother of grass and native species by the more vigorously growing legumes.

6. Subsequent topdressing with superphosphate and grazing control are necessary to maintain herbage production and the balance of sown and native species. The rate and frequency of topdressing for optimum results are under investigation, as are the possible responses to lime, sulphur, and various trace elements.

Many problems remain to be solved, but the possibility of improving fescue tussock grasslands by introducing legumes has been amply demonstrated. A mixture of Certified white clover (1lb.), alsike (2lb.), and lucerne (2lb.), together with 10lb. each of cocksfoot and tall oat grass, drilled during spring with 2cwt. per acre of superphosphate can be relied on to give satisfactory results in the Mackenzie Country. Reduction of the alsike to 1lb. and the inclusion of Montgomery red clover at 2lb. should also be satisfactory.

Blocks of fescue tussock improved by introduction of the species mentioned will prove very useful to high country runholders for such special times as weaning, at shearing, immediately before winter, and at lambing. Such areas should assist particularly in overcoming the normal winter feed shortage for ewes and hoggets, especially at the end of winter.

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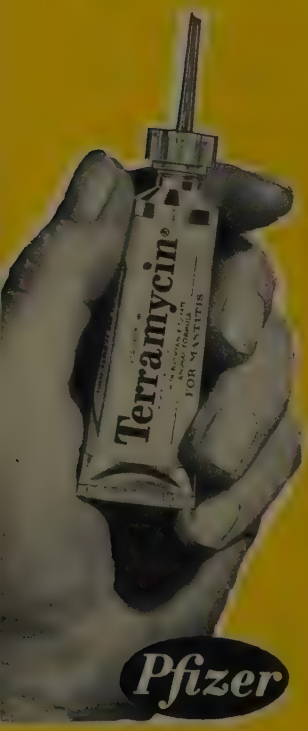

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The Home Orchard in Autumn

IN autumn the grower is rewarded for his intensive work in spring and summer. If the weather has been favourable, spraying and thinning of the crop should have produced clean, good-sized fruit, and the only important work left is harvesting the crop. There is still other work of interest to be done in the orchard, however, and in this article S. P. Money, Horticultural Instructor, Department of Agriculture, Wellington, discusses autumn activities.

[*Sparrow*

AFTER the crops have been removed from trees, vines, and canes diseases and pests from the season's crop are often left behind as spores, eggs, or live areas of bacterial infection. Steps should be taken to prevent these diseases and pests being carried over to the following season.

Tree Fruits

In pears and quinces the presence of fireblight, a bacterial disease, is shown by dead shoots with black leaves still adhering. Affected shoots should be removed by cutting from 6in. to 10in. below the point of infection. If cutting in this manner would leave a short stub, the branch should be cut back flush with the stem. All wounds should be sealed and the diseased portions of the tree burnt.

Mummified fruit from brown rot infection should be collected and burnt. This includes both the mummies left on the tree and those on the ground. Where there has been a great deal of trouble with this and other fungous diseases it is wise to clear weeds and grass from beneath the trees before the ground is dug over to ensure that all diseased fruit is removed.

Selection of Varieties

In autumn thought should be given to the choice of fruit varieties to be planted in winter either as replacements or as an additional area. Varieties should be selected to give a supply of fresh fruit for as long as possible throughout summer and autumn, with one or two good long-keeping varieties that mature late for storing during winter.

In apples and pears there are early maturing varieties of both culinary and dessert types. Culinary varieties of apples such as Alfriston and Mobb's Royal are not good-quality apples, but are popular because they mature early—in mid-December or late December in most districts. The same applies to the dessert apples Irish Peach and Red Astrachan. Gravenstein is in rather a different category, being a better-quality fruit and suitable for both dessert and culinary purposes.

Early pears are not as sought after as early apples by home orchardists, but one of the most common of this type grown in the home orchard is Jargonelle.

Mid-season fruit provides a much wider range of varieties and quality. The well-known dessert apples Cox's Orange Pippin, Kidd's Orange Red, Delicious, Golden Delicious, and Jonathan ripen at this time, and in culinary varieties Ballarat, Lord Wolseley, and Dunn's Favourite are popular, particularly Dunn's Favourite because of its slow maturity. This apple does not need to be picked over a short period, and often may be picked over a period of up to 6 weeks.

The main crop of pears begins to mature during late February and March. Varieties such as Williams Bon Chretien mature in February and P. Barry, Packham's Triumph, Beurre Bosc, and Winter Cole in March. P. Barry is noted for its long keeping qualities, and Packham's Triumph (dessert) is useful for cooking.

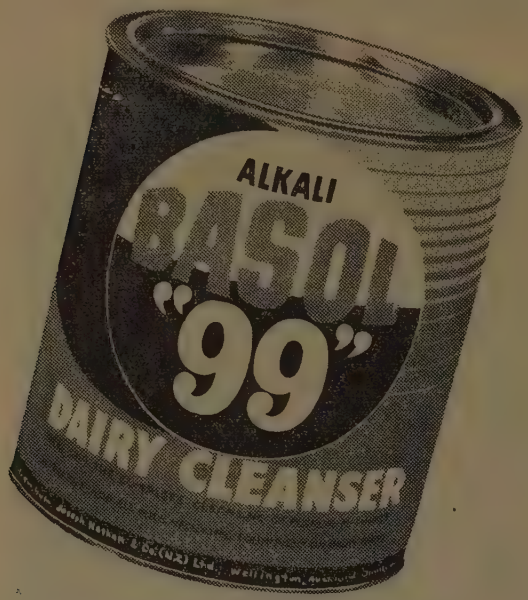
The two most useful late varieties of apples in the home orchard are Granny Smith and Sturmer Pippin, both of which can be used equally well for dessert or culinary purposes and have remarkable storage qualities.

Winter Nelis is a late pear which could be grown in the home orchard, but unless there is a particular need for a pear maturing in April, this could be left from the planting schedule, as in this variety trouble is often experienced with shy bearing.

Care of Spray Equipment

When the last autumn sprays have been completed it is good policy to wash and clean all spray equipment thoroughly. This will combat corrosion caused by residues of sprays. Several gallons of hot, soapy suds should be pumped through the equipment. If no washing after spraying has been done during the season, it would be wise to leave the sprayer filled with soapy water overnight.

If spray equipment has become contaminated with residues from weed-killing hormone sprays, water containing 1 tablespoon of activated charcoal per gallon should be pumped through the whole system, including nozzles. If this charcoal is not available, the spray outfit should be washed with warm, soapy water, and a mixture of household ammonia and water in the proportions of ½ pint of ammonia to 4 gallons of water then pumped through. These operations should be carried out with the hose nozzle directing the spray back into the tank to allow continued circulation. If warm water is used, the solution once circulated should stand in the equip-



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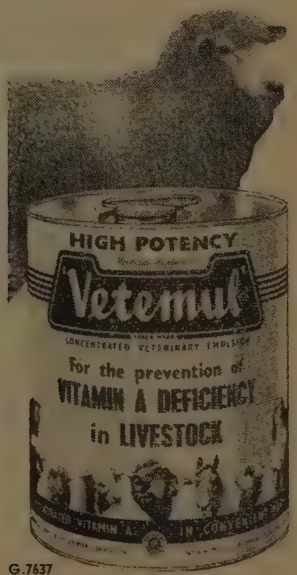

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ment for 18 hours; if cold water is used, it should stand for 36 hours.

Cicada Damage

In areas close to native bush a great deal of damage is done to orchard trees through the deposits of eggs by the cicada, wrongly called locust by many in New Zealand. This insect leaves a series of chevron-shaped incisions in the bark, often destroying a number of buds in the process. This damage is not generally noticed until the trees have lost a good deal of their summer foliage.

Where damage is severe on wood which will remain on the trees after pruning in winter, the wounds should be dressed with a sealing compound such as heavy petroleum jelly, grafting mastic, or red lead priming paint to seal the damage and thus prevent the entry of fungous diseases such as bracket fungi and silver leaf. Silver leaf has caused considerable damage in stone fruit in areas where cicada damage is prevalent and also in apples grown in damp climates. Apart from allowing entry of disease, cicada damage weakens branches, which often break when loaded with fruit.

Lichen

Another trouble which becomes apparent when trees lose their leaves in autumn, and is usually associated with neglected orchards, is growth of lichens on branches. These interesting little plants are often mistaken for diseases, but they use the trees merely as support, being completely independent of them.

Lichen is really a combination of two kinds of plant life. The main plant shape is formed by a fungus, usually belonging to a group known as the ascomycetes, and living among the strands of the fungus are single-celled green algae. It is thought that the fungi protect the algae from being dried out and provide moisture, and the algae contribute the carbohydrates that the fungi are not able to make for themselves.

Lichen can be removed easily from trees by late autumn sprays of lime sulphur at 5 fl. oz. to 4 gallons of water or by winter application of red oil.

Berry Fruits

In autumn berry fruits require little attention, but old canes of raspberries which were not cut out after the fruiting season should be removed.

Strawberries

Ground for strawberry beds which during summer had green crops or humus dug into it should be prepared for setting out of strawberry plants in March. The ground should be dug deeply (8in. to 10in.) to encourage an adequate root run and to give good drainage, as strawberries are sensitive to excessive water or continued damp

[*Sparrow*

The roots of strawberry plants should be trimmed before planting to remove any damaged portions. Left—A plant with untrimmed roots. Right—A plant with roots trimmed ready for planting.

conditions. Before planting a base dressing of manure should be applied consisting of elements which will be available in the soil for a long time. A good mixture is blood and bone (3 parts by weight), superphosphate (2 parts by weight), and potash (1 part by weight). This mixture should be applied at from 4oz. to 8oz. per square yard.

The normal method of propagation of strawberries is by runners. These can be bought or taken from the grower's own bed. Care should be taken to set out only strong and disease-free plants. Plants should be set out as soon as possible after lifting from the runner bed.

Planting: Strawberries can be planted at various distances, depending on the variety. Plants of a variety known to grow large can be planted in rows 30in. apart, with plants 18in. apart. With smaller varieties rows can be 24in. apart and plants 15in. apart.

The holes for the plants should be big enough to allow the roots to be spread out without cramping. Before planting it is wise to trim the roots as shown in the illustration above, thus removing any damaged portions of the roots. This also makes the plants more convenient for the planter to handle. The plants should be placed in the hole at the correct depth, with the division between the crown and the roots at the soil surface, and the soil worked in among the roots. The plants can be further settled by being watered immediately after planting.

Some varieties grow and crop much better in some districts than in others. It is best to select a variety which has proved suited to the district. The following is a short list of the most popular varieties grown at present in various districts.

Auckland: Captain Cook.

Hawke's Bay, Wairarapa, and Wellington: Auchincruive Climax, Chapman's Seedling, Huxley, and Royal Sovereign.

Nelson: Chapman's Seedling and Auchincruive Climax.

Canterbury: Auchincruive Climax, Perle de Prague, and Chapman's Seedling.

Otago: Auchincruive Climax, Perle de Prague, and Ettersburg.

Diseases and Pests

The battle with diseases in the home orchard presents an ever-changing picture. New materials and techniques are constantly being introduced to combat problems which arise continually owing to the ability of the pests and diseases to evolve new types which may partly or wholly tolerate the materials normally used to control them.

An example worth quoting has been the effect of DDT, an insect spray, on various types of flies. The life cycle of the fly is short and in one season many generations of flies are born. This allows for rapid evolution and a rapid build up of resistance in some cases to this spray material. As DDT has now been used

for some years, strains of flies have evolved which are completely resistant to it. There are many types of flies attacking horticultural plants. In the orchard the pear slug or leech, the larvae of the saw fly, can be responsible for severe leaf damage.

Plant breeders, too, play their part by breeding plants which combine good cropping qualities with resistance to disease. Results achieved in this manner, however, are not always permanent, owing to the changes in diseases and pests already mentioned. Once a chance combination of factors which will overcome the resistance of the plant occurs in a disease a small infection can occur. These first infections may not be serious, but further change in the disease allows widespread infection and complete loss of resistance by the host plant. This has been shown in recent years in the resistance to rust of the Lloyd George raspberry.

When this raspberry was first introduced into New Zealand from Britain it proved entirely resistant to rust, a disease which appears as bright orange spots on raspberry leaves. Large numbers of this variety were planted in home orchards and commercial gardens. From an occasional infection of rust in this variety 3 or 4 years ago the incidence has increased until now it is not uncommon to see plantings of Lloyd George showing heavy infection. Fortunately this disease has little or no effect on the crop.

The best spray for the control of rust on raspberries is lime sulphur and colloidal sulphur applied in autumn. A spray of suitable strength

Fireblight canker on a pear branch. This bacterial disease also affects apple and quince trees.

for this can be made by mixing 3 fl. oz. of lime sulphur and 1 fl. oz. of colloidal sulphur with 4 gallons of water. This should be sprayed on the canes and ground litter and will help to reduce the carry-over of disease next spring.

Storage of Fruit

Storage of fruit from the home orchard presents a problem. Few home orchardists have elaborate means of storing surplus crops, but provided cool, dry conditions are available, apples, pears, almonds, and walnuts can be kept for considerable periods. Apples and pears to be stored should be well grown but not ripe. All fruit for storage should be free from insect or fungous damage. It is a good plan to spray a tree from which fruit is to be stored with bordeaux mixture shortly before harvesting. This protects the fruit during storage from many of the fungous diseases attacking stored crops.

Fruit from mature trees is known to keep longer than crops from young trees, and small and medium fruit keep better than large, coarse, or misshapen ones.

Probably the most simple and efficient method of storage for the home orchardist is to wrap each fruit tightly in newspaper and place it in tight-fitting layers in a box. Care should be taken to avoid bruising during this process. The boxes thus packed should be placed in a cool, dry position and not disturbed until the fruit is required.

Nut crops are best stored in open trays where a watch may be kept for insect pests. If pests appear, spraying with DDT should check their spread through the stored crop.

Meteorological Records for December

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in Inches					Bright sunshine hours
		Approx. mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Kerikeri	201	65.7	+ 3.0	80.5	47.4	7.83	13	+ 3.98	2.90	16	134.6
Auckland	160	65.8	+ 2.1	80.2	52.0	3.11	10	+ 0.18	1.80	6	234.7
Tauranga	10	63.9	+ 1.8	80.3	46.1	2.37	12	— 1.16	0.70	17	232.9
Ruakura	131	62.9	+ 2.2	80.7	40.0	3.29	7	+ 0.21	1.95	6	151.7
Rotorua	975	62.6	+ 2.6	80.0	40.8	5.23	11	+ 1.25	1.72	16	214.4
Gisborne	12	63.6	+ 0.9	82.4	42.8	1.26	12	— 0.65	0.23	6, 25	222.0
New Plymouth ..	160	61.8	+ 1.8	77.1	43.5	4.41	6	— 0.18	2.02	5	270.7
Kariol	2125	57.6	+ 2.4	75.2	33.4	2.48	7	— 1.43	1.18	6	
Napier	5	63.7	+ 0.5	80.2	48.0	1.54	10	— 0.44	0.31	14	233.3
Wanganui	72	63.0	+ 1.6	80.2	36.4	2.33	4	— 0.53	1.18	6	279.4
Palmerston North .	110	61.6	+ 1.2	78.8	44.8	2.10	6	— 1.18	0.91	6	250.0
Waingawa	340	61.0	+ 0.8	85.0	36.0	2.38	9	— 0.13	0.92	16	242.5
Wellington	415	59.9	+ 0.8	73.8	45.0	2.18	10	— 1.28	0.66	5	246.8
Nelson airfield ..	5	60.1	+ 0.7	76.7	41.6	3.48	6	+ 0.64	2.11	5	250.2
Blenheim	12	61.4	+ 0.6	87.1	37.4	1.55	5	— 0.45	0.85	5	232.6
Hokitika	15	59.2	+ 3.1	72.0	42.1	2.92	7	— 7.04	1.41	5	194.6
Hanmer	1270	59.6	+ 1.8	87.0	32.4	1.36	8	— 2.35	0.35	26	231.3
Christchurch ..	22	62.0	+ 2.2	90.8	37.0	0.51	5	— 2.03	0.17	25	233.5
Ashburton	323	62.6	+ 3.5	85.0	37.0	0.88	4	— 2.13	0.66	26	225.7
Timaru	56	61.8	+ 3.1	87.2	38.4	0.39	5	— 2.27	0.13	25	222.4
Alexandra	520	64.6	+ 4.4	90.4	35.3	0.05	3	— 1.25	0.03	14	293.5
Taieri	80	57.8	+ 1.8	81.9	30.0	0.69	9	— 1.87	0.30	24	233.7
Invercargill airfield	9	56.2	+ 1.2	77.5	35.4	1.16	8	— 2.44	0.60	24	237.5
Chatham Islands ..	140	54.0	— 1.0	66.1	38.3	2.30	12	+ 0.01	0.78	15	

Book Review

"First Steps in Farm Engineering"

AS agricultural engineering is taking its place as a specialised branch of engineering, that is, as a merging of the science of engineering with the science of agriculture, any publication which can be used in the training of agricultural engineers is of value.

Herein lies the value of this book by "Seatrail" of "Power Farmer" (England), which takes the all-important engineering subject of mechanics and treats it with all its phases in logical sequence in a clear, easily readable style.

Separate chapters are devoted to phases such as levers, forces, power, energy and work, acceleration and motion, and beams and frames. Each phase is clearly and logically treated and principles are well illustrated with diagrams, examples being based on practical problems on the farm.

For the non-technical farmer who desires an insight into the fundamentals of mechanics applicable to farm problems or for the student in agricultural engineering this book should prove of value.

—*H.W.T.E.*

Light-weight Concrete as a Building Material

IN the first section of this article, which was published in last month's "Journal", H. W. T. Eggers, Engineer, Department of Agriculture, Wellington, explained the advantages and disadvantages of light-weight concrete as a building material. The concluding section below discusses the properties of perlite concrete and describes how building units can be cast in it.

TO understand the characteristics of perlite concrete both during preparation and after it has set some aspects of its manufacture must be considered. To obtain concrete having defined characteristics of density, strength, and insulating value a certain degree of air entrainment of the concrete itself has to be practised. This is accomplished by machine mixing and by the addition to the mixing water of a specified amount of neutralised vinsol resin if the concrete is not to be made water repellent or a special water-repelling agent if the concrete is to be made non-absorbent. These additives act not only as an air entrainer on the one hand and water repeller and air entrainer on the other, but as "wetting" agents for the mix. This ensures that the yield of wet concrete from the mixer is within defined volume limits and is expressed as a percentage of the volume of loose aggregate used, excluding the cement.

The yield of wet concrete from the mixer when vinsol resin is used should be between 90 and 100 per cent. of the loose volume of the aggregates. For example, if 1 cub. ft. of perlite has been used with 1/6 cub. ft. of cement in a 6 : 1 mix, the yield of wet concrete should be slightly under 1 cub. ft.

When perlite water repellent agent is used the yield should be between 80 and 90 per cent. of the loose volume of the aggregates.

When any concrete aggregate is batched by volume measurement the yield from the mixer is always less than the volume of aggregates used, as the fine aggregates fill the voids between the coarse aggregates during mixing. If, other things being equal, the volume of wet concrete can be kept constant, the resultant dry concrete will be constant for each batch in both density and crushing strength.

Air entrainment increases the insulation value, but decreases both density and strength, as a study of Table 1 will show. For example, item 12, which is a 5 : 1 perlite concrete containing an air-entraining agent, has a density of 29lb. per cubic foot and a crushing strength of 260lb. per square inch, whereas item 9, which is the same mix but contains no air entrainment, has a density of 66lb. per cubic foot and a crushing strength of 675lb. per square inch. The yield from the mixer in the first case was between 95 and 100 per cent. and in the second case was 75 per cent. only.

The Standard Building Code recommends that concrete masonry units for load-bearing walls should have a compressive strength of not less than 800lb. per square inch. Straight perlite concrete has not sufficient strength to comply with this recommendation unless used without air entrainment or with uneconomical proportions of cement.

The density and strength of straight perlite concrete vary with the proportions of cement and perlite and can also be increased by the omission of air entrainment.

Perlite-sand Blending

The first part of this article mentioned that the density of sand-cement concrete could be reduced by blending it with perlite; that is, a light-weight concrete could be obtained by replacing a proportion of the ordinary aggregate with light-weight aggregate.

Blending of a dense material with a light-weight material may not appear good practice, as the dense material minimises the advantages of insulation gained by use of a light-weight material. However, in the manufacture of such items as concrete blocks for the construction of walls of buildings a saving in weight effects savings in cost, which can be considerable.

A reduction in weight of superimposed courses in concrete block construction means that the load-carrying capacity of the lower courses can be safely reduced, resulting in a saving of material. Any reduction that can be made to the load-carrying capacity of lower structural members by a reduction in weight of superstructure is advantageous and tends to reduce destructive forces resulting from earthquake.

Straight perlite concrete has not sufficient strength, unless used without air entrainment, to be suitable for the manufacture of concrete masonry units for the construction of load-bearing walls. If it is used without air entrainment, the volume of perlite required for any given construction would make its use uneconomic. However, if a substantial proportion of perlite is replaced with sand, the cost can be considerably reduced and

Fig. 1—A pig farrowing house made from panels of light-weight concrete.

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sufficient strength and lightness maintained to produce satisfactory load-bearing concrete masonry units.

Though the use of an air-entraining agent is an advantage with straight perlite concrete, its use with perlite-sand blends is a disadvantage. The reason for this is that the foaming action is increased during mixing by agitation caused by the sand particles. If the sand is coarse, greater agitation takes place, with consequent greater air entrainment. As effective control of air entrainment would therefore depend on the sand grading, close control is impossible, because sand gradings can vary from day to day from the same source of supply.

In the blending of sand with perlite for concrete having the same aggregate-cement ratio it has been found that:—

1. The substitution of up to 50 per cent. by volume of sand, though increasing the density, does not appreciably increase the strength.
2. The substitution of over 50 per cent. of sand increases both the density and strength.

Conversely this means that:—

1. The substitution of up to 50 per cent. by volume of perlite decreases both density and strength.
2. Sufficiently high strength for load-bearing masonry manufacture can be obtained with reasonable density.

This opens up a new field in concrete masonry manufacture, because if the weight of ordinary sand-cement concrete can be reduced by the substitution of a portion of the sand with perlite and sufficient strength to meet structural requirements is still retained, larger block units can be manufactured which will still be light enough to handle. As fewer units will be required for any given structure, less labour will be involved in their laying.

Table 1 gives a range of concrete densities with relative strengths and insulating values (where available) from ordinary sand-gravel concrete to straight perlite concrete.

Fig. 2—The wooden moulds used for casting panels for the pig farrowing house shown in Fig. 1.

Economic Aspects of Blending

As economy is an important factor in the manufacture of concrete masonry, Table 2 has been compiled to show the relative cost per cubic foot of straight perlite concrete and various perlite-sand or sand-perlite blends. Aggregate-cement proportions are the same for each mix and the cost given is for finished concrete, with due allowance for yield.

The addition of sand to perlite concrete can reduce the cost per cubic foot of finished concrete by as much as 18 per cent. without altering the aggregate-cement ratio.

Ageing Characteristics

Ageing characteristics of light-weight aggregate or movement due to moisture can be detrimental. This movement expresses itself differently with different light-weight aggregates. With pre-treated pumice it is expressed by cracking, but with perlite it is expressed by bending or twisting of the moulding. This movement of perlite concrete follows a regular pattern—slight expansion during the first month, followed by shrinkage for the next 2 months, when it becomes partially stable. Shrinkage during the next 6 months is only very slight.

TABLE 1—STRENGTHS AND INSULATING VALUES OF CONCRETE MIXES

Aggregate	Mix proportions, parts	Average density, lb. per cub. ft.	Average comp. strength, lb. per sq. in.	Increase in insulation value over that of ordinary concrete	Remarks
1. Sand-gravel	4 : 2 : 1	140 to 150	2000 to 3000		
2. Broken brick-sand	4 : 2 : 1	110 to 135	1500		Weaker aggregate
3. Clinker-sand	4 : 2 : 1	80 to 110	1200		Still weaker aggregate
4. Perlite-sand	2 : 2 : 1	100	1400		No air-entraining agent; poured concrete
5. Perlite-sand	3 : 5 : 2	94	1080		No air entraining; block mix
6. Perlite-sand	2 : 2 : 1	75	567		Block mix
7. Perlite-sand	5 : 3 : 2	73	500		Block mix
8. Perlite-sand	3 : 1 : 1	60	430		Contains air entraining; poured mix
9. Perlite ..	5 : 1	66	675		Poured mix; no air entraining
10. Perlite ..	3 : 1	48	800	About 10 times	Contains air entrainment
11. Perlite ..	4 : 1	35	440	About 16 times	
12. Perlite ..	5 : 1	29	260	About 20 times	
13. Perlite ..	6 : 1	26	175	About 22 times	
14. Perlite ..	7 : 1	23	125	About 48 times	
15. Perlite ..	8 : 1	21	90	About 24 times	

TABLE 2—COST PER CUB. FT. OF PERLITE CONCRETE AND PERLITE-SAND BLEND CONCRETE

Mix	Without additive 75 per cent. yield	With vinsol resin 95 per cent. yield	With water repellant 85 per cent. yield
	Perlite concrete		
	s. d.	s. d.	s. d.
3 : 1 ..	8 4	7 3½	9 2½
4 : 1 ..	7 2½	6 3¼	7 8¾
5 : 1 ..	6 6	5 7	6 10
6 : 1 ..	6 0½	5 3½	6 3
7 : 1 ..	5 8½	5 0¼	5 10½
	Sand blends*		
3 : 1 : 1 ..	6 8½	5 9	7 2
5 : 3 : 2 ..	6 4½	5 6	7 0
2 : 2 : 1 ..	6 1½	5 6	6 9
3 : 5 : 2 ..	5 10	4 11½	6 6

* Order of mix classification—light aggregate, heavy aggregate, cement.

All blends are equivalent to 4 : 1 mix expressed in descending quantities of perlite and ascending quantities of sand.

Shrinkage during the second and third months can cause long mouldings to bend appreciably, but if they are allowed unrestricted movement, they will return to nearly normal during the following 3 months. Mouldings can be induced to return to absolute normal by stacking them with their weight opposed to the bend.

With cast panels over 7ft. long this bending may be detrimental, but in short panels or blocks it would have no effect on the use of the units.

The movement of blocks which have very short dimensions is too small to be detrimental unless the blocks are used during the 2 months following curing in mortared construction where

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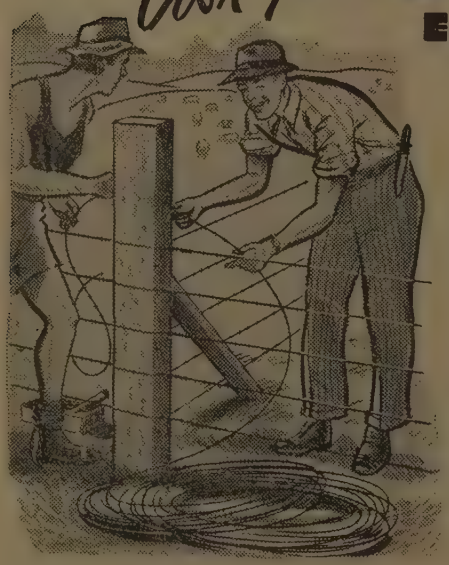

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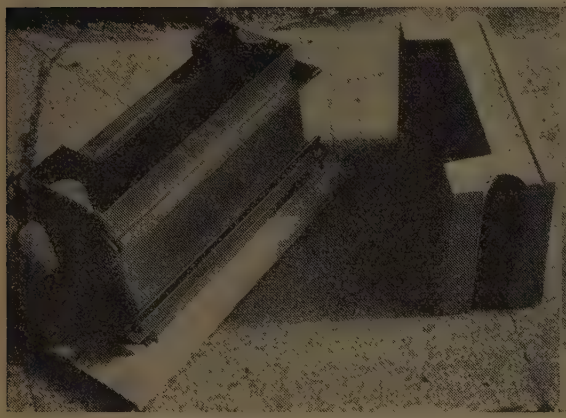
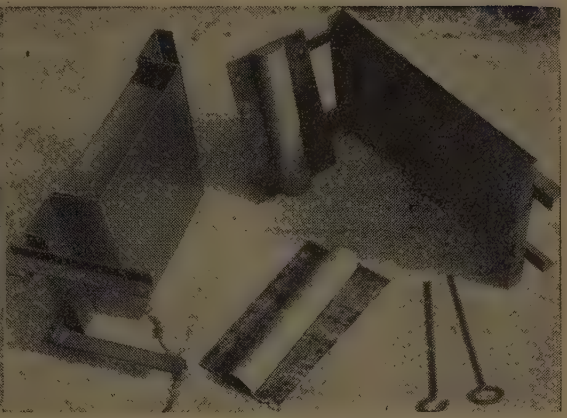


▲ Fig. 3—A steel mould (left) for wall blocks and a cast block (right).



▲ Fig. 4—The same mould after being separated into its component parts.

they would be restrained. Movement then might result in cracking.

Perlite concrete blocks should not be used for construction until they have aged at least 3 months or until moisture equilibrium is reached. Like blocks, green panels can quite easily crack if any restraint is placed on them by their use in construction.

This of course applies only to perlite concrete with which steps have not been taken to control or eliminate moisture movement, and though concrete masonry can normally be used once maturity has been reached, the units will still be subject to movement through moisture.

Perlite Water Repellant

If perlite water repellant is used as an additive to the mix, the resultant concrete will have permanent stability. This additive, by chemical combination with the free lime in the cement, renders the concrete water repellent throughout. It should not be confused with waterproofing or water-repellent agents, which are applied after the concrete has hardened and which either create a mechanical dam on the surface of the concrete or produce a water-repellent surface. The action of this agent is entirely different, as it renders the concrete waterproof right through its depth; if the surface of concrete treated with waterproofing is damaged, the effectiveness of the waterproofing is lost, whereas this new agent by waterproofing the concrete right through makes a broken piece of concrete just as impervious to moisture as a whole unit.

The attainment of permanent stability of concrete masonry removes any tendency for walls to crack through moisture movement of the units. Walls may still crack from other causes such as settlement, but this type of cracking is controllable because if foundations are adequate, no settlement will occur.

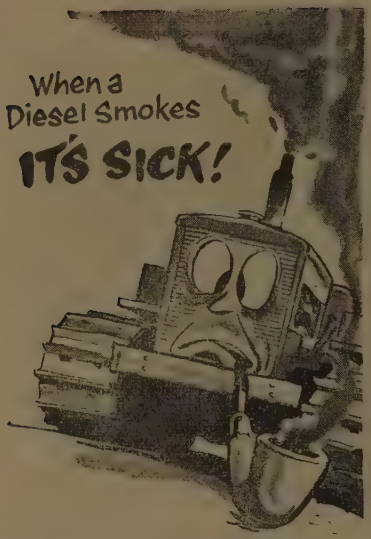
With perlite concrete this additive also acts as an air entrainer and wetting agent, so there is no necessity to use any further additive in the mix.

Use of Water Repellant with Sand Blends

Though air entrainment is not advisable with perlite-sand blend concretes and the use of perlite water repellant does give some degree of air entrainment, this disadvantage is only in the manufacture of the concrete, and the tremendous advantages of

▲ Fig. 5—A steel corner block mould and cast block.

▲ Fig. 6—The same mould separated into its component parts.



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waterproofing and permanent stability obtained completely outweigh any disadvantages.

By the blending of perlite with sand and use of perlite water repellant concrete masonry units can be produced for external wall construction having the requirements of strength and reasonable insulation value while also being light enough to handle and waterproof. These units will have permanent stability and will not be subject to moisture movement when maturity has been reached.

The strength of perlite-sand blend concrete in relation to its density cannot be guaranteed, as it will vary with the sand grading. Each mix would need to be tested individually to ascertain the results and strengths when any particular sand is used.

Uses of Perlite

Perlite is not only a versatile material for concrete manufacture, but its insulating qualities can be utilised in other ways. For example, loose perlite fill of spaces in walls has a high insulating value and it does not pack if properly placed. It can also be used for mixing with gypsum to produce a fibrous wallboard of about half the weight and four times the insulating value of ordinary plasterboard.

Concrete which differs in its characteristics but which is suitable for different parts of a building can be produced by varying it according to the three requirements of strength, weight, and insulation. For example, for window sills which do not require structural strength a low-strength straight perlite concrete mix could be used, whereas for blocks for load-bearing walls a stronger sand-perlite blend could be used.

Fig. 7—An E.S. nail embedded in perlite concrete. Inset are shown E.S. nails before being driven (at top) and after being driven (at bottom).

Perlite concrete can be used to advantage for floor slabs, roof slabs, as an insulating layer over ordinary concrete for floors, or for any application where the high strength of normal concrete is not required or necessary and where economies or better insulation can be obtained by the use of a lighter material.

The following examples illustrate the various uses of perlite concrete.

For small buildings, such as the pig farrowing house shown in Fig. 1, where strength is not as important a factor as insulation perlite concrete units can be cast with just sufficient sand added to produce the required strength. Panels for this house were cast in the moulds shown in Fig. 2 in 3 parts of perlite, 1 part of sand, and 1 part of cement, with 5oz. of air-entraining agent per cubic foot of perlite. This mix produced concrete of 60lb. density, having a crushing strength of 400lb. per square inch and an insulating value about ten times that of ordinary concrete. The following is a comparison of the characteristics of panels cast in perlite-sand blend and those cast in ordinary concrete:—

	Perlite-sand blend 3 : 1 : 1 mix	Ordinary concrete 3 : 2 : 1 mix
Weight of panel	124lb.	290lb.
Crushing strength	400lb. per square inch	2000lb. per square inch

These figures show that strength has been sacrified for a saving in weight and an increase in insulating value, but sufficient strength to meet handling and structural requirements has been retained. The panels can easily be handled by two men.

The blocks shown in Figs. 3 and 5 are cast for dwelling house construction, in which sufficient strength for load-bearing purposes is required. As these blocks are for the outside wall and the building design specifies a vapour barrier of aluminium foil or other suitable material and a cavity between this barrier and the internal lining, insulation is not such an important factor as strength. However, the blocks must be reasonably light for handling.

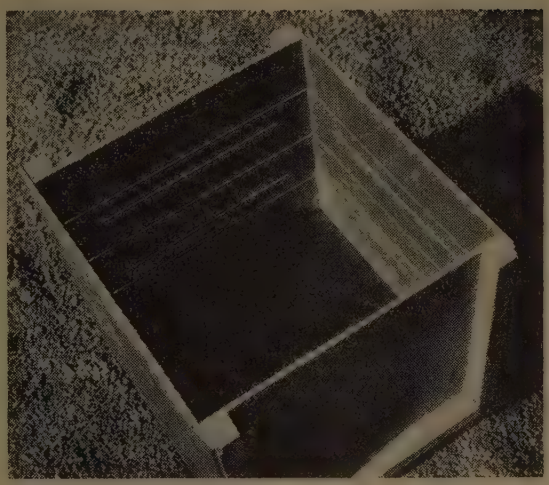

Fig. 8—An aggregate measuring box with scribed measuring lines.

The perlite-sand mix chosen for these blocks was 2 parts of perlite, 2 parts of sand, and 1 part of cement. As this was to be used as a block mix, that is, relatively dry, no air entraining was used, but the required quantity of water repellant was added to the mixing water. This mix produced concrete having a crushing strength of 600lb. per square inch and a density of 78lb.

Details of the blocks and those of ordinary concrete are:—

	Perlite-sand blend 2 : 2 : 1 mix	Ordinary concrete 3 : 2 : 1 mix
Weight of block	39lb.	75lb.
Crushing strength	600lb. per square inch	2000lb. per square inch

The perlite blocks, being lighter, could be handled with much less fatigue, and the crushing strength conformed to requirements. The insulation value was four times greater than that of ordinary concrete.

Perlite Nails

As ordinary nails have no holding power in perlite concrete, special nails known as E.S. nails have been devised which obtain a reasonably effective grip of the concrete. These nails are shown in Fig. 7. The nail consists of a split shank with a head somewhat like an ordinary cotter pin. While being driven the two halves retain their relative positions, but when the head reaches the loose washer through which the nail is driven and is flattened, a small barb on one half of the nail is projected into the concrete. The broken specimen of concrete shows the barb extended into the concrete.

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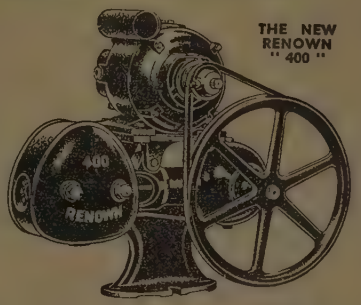

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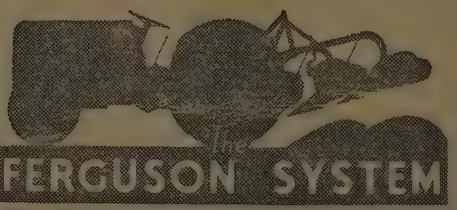

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In pull tests conducted with these nails an average pull of 39lb. was required to withdraw the nail from the concrete. When a pull of 55lb. was exerted the nail left the concrete with a groove cut by the barb as it withdrew.

Mixing Poured Concrete

Light-weight aggregates require different mixing techniques from ordinary concrete aggregates. If the amateur is to use perlite successfully, he must follow a certain procedure and exercise the necessary care entailed by that procedure.

The shovel and water dipper, which may be the usual measuring mediums of the amateur concreter, are not accurate enough for concrete making with light-weight aggregates. All measurements can be done by volume, but as they must be reasonably accurate to obtain good results, the shovel must be replaced with a measuring box.

Fig. 8 shows the details of construction of a measuring box of 1 cub. ft. capacity, which is a convenient size for measuring quantities for, say, a 2-cub. ft. mixer. The measuring lines show ¼, ½, and ¾ cub. ft.; other lines show ⅛ and ⅜ cub. ft. Owing to their surface nature the perlite particles not only are fairly easily crushed, but offer resistance to the skin friction of the mixing water, making them difficult to "wet".

For these reasons and also to obtain a constant percentage yield of wet concrete from the mixer a wetting and air-entraining agent is added to the mixing water. This additive also permits the water-cement ratio to be reduced, thereby producing stronger concrete. A fixed amount of water is required to produce wet concrete of the correct consistency.

Fig. 10—Timber moulds for casting perlite concrete panels. The horizontal bases are rigid.

The makers of perlite aggregate can supply data sheets giving properties, mix proportions, and quantities of materials required for concretes of various densities and strengths.

Mixing procedure for perlite concrete is as follows:—

The specified amount of mixing water is put into the mixer and the required proportion of air entrainer added. The mixer is then started and the specified amount of cement for the mix measured out and put in. The water and cement should be allowed to mix for 2 or 3 minutes to obtain aeration and permit slurry to form. Half the total quantity specified of perlite aggregate can be added to the mix. This will wet down while the other half is being measured.

The second half should be added to the mixer slowly to avoid too rapid absorption of water, which causes the mixture to clog round the bottom of the bowl. The mixture must not be permitted to get too dry while the second half of the perlite is being added, as it will immediately clog the bowl. Very small amounts of water can be added to prevent clogging. When the whole of the perlite has been put in, the mix will appear too dry to work, but a few minutes' mixing will soon distribute the water evenly and the resultant wet concrete should leave the mixer with about the consistency of thick oatmeal porridge.

Long mixing periods must be avoided, as the perlite granules have a tendency to crush in the mixer. The recommended mixing time is 2 minutes or until the desired wet density is reached.

In measuring of both cement and perlite with the measuring box shown in Fig. 8 it is necessary to shake both down to the level of the measuring lines; otherwise uneven proportioning will result. As the concrete leaves the mixer the yield can be measured as a density check for the dry concrete. The yield from the mixer should be between 90 and 100 per cent. of the loose volume of aggregates used, excluding the cement.

Yield can easily be measured with a kerosene tin bucket (4 gallons), which holds approximately ⅔ cub. ft. One and a half buckets represent 1 cub. ft. The measuring of a yield is shown in Fig. 9.

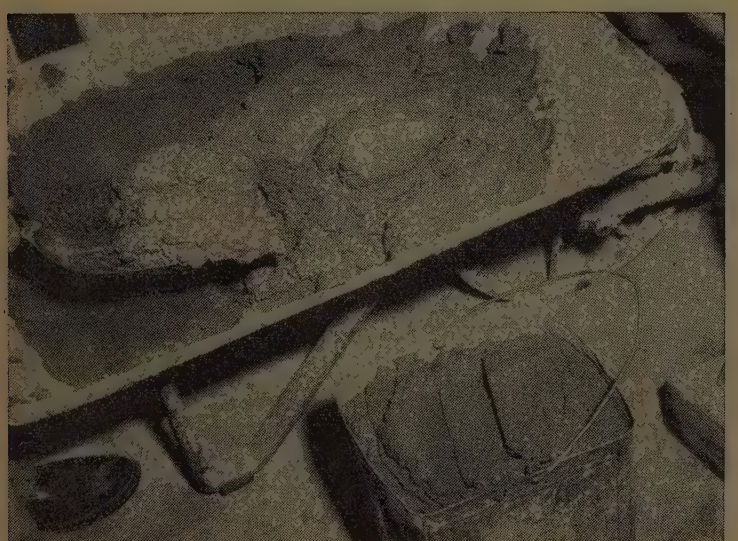

Fig. 9—A kerosene tin bucket, which holds about 2/3 cub. ft., can be used to measure the yield of concrete from the mixer. The concrete above has the correct consistency of thick oatmeal porridge.

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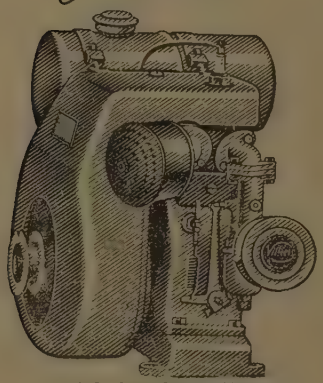

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If the yield is over 100 per cent., the resultant concrete will be of lower density than specified; if the yield is under, the density will be higher. Prolonged mixing increases the yield by increasing aeration of the batch.

Mixing Block Concrete

For concrete for block making, which requires a relatively dry mix, it is preferable to mix perlite aggregate by hand with a square-nosed, long-handled shovel unless the amateur has access to a mixer specially constructed for dry mixing. Damping dry ingredients in a bowl mixer with small quantities of water causes the materials to stick to the sides of the bowl. As perlite aggregate is very light, mixing can be carried out on a smooth concrete floor or properly constructed mixing board without much expenditure of energy, particularly as quantities greater than can be conveniently used in 2 hours should not be mixed at any one time.

The requisite quantity of dry perlite should be spread out on the mixing site and the measured quantity of cement carefully spread over it. As loose cement is much heavier than loose perlite, care must be taken in placing the cement on the perlite, as any heavy impact will cause the perlite to scatter. Cement and perlite can then be stacked and the whole turned over at least three times or until it is uniform in colour. Wetting the mix slightly while this is being done is advisable to prevent perlite dust from rising.

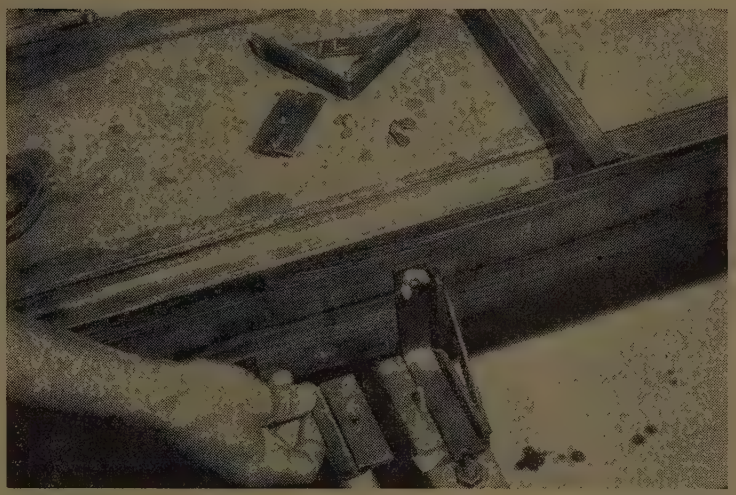

Fig. 13—One of the side board brackets and clamps used to hold the side boards square with the bases of the moulds shown in Fig. 10.

Fig. 11 (upper)—A multiple block mould assembled for casting. The core is in place and the plug inserted. A block cast in the mould is in front. Fig. 12 (lower)—The same mould separated. The vertical grooves enable the steel divider plates to be "leapfrogged" along the mould. The end ties are of angle steel.

This dry mix can be damped down with water from a watering can or a fine hose rose with not too much pressure, damping and turning over being continued until a handful of the mixture can no longer be moulded in the hands without cement paste being left adhering to the skin. To do this the mixture must be beaten firmly between cupped hands.

As block mixtures are moulded by compression and tamping, air entrainment would be no advantage. With perlite, however, it is an advantage to add about 0.4 per cent. by volume of a soapless detergent as a wetting agent to the mixing water. This produces uniform wetting of the materials and also some reduction in the quantity of water required.

The simplest method of combining a small quantity of wetting agent with the mixing water is to apply the mixing water with a bucket pump fitted with a fine rose. Water can be measured into the bucket by the gallon and if 1 level tablespoon of wetting agent to the gallon is added and stirred in, the mix will be of the right proportion. If this method is followed, any water not used remains in the bucket and can be added to for the next batch. Cleaned 1-gallon paint tins are very convenient to measure water for concrete mixing, as 1 gallon is about 1/6 cub. ft. and the relation-

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Perlite aggregate cannot be handled in a high wind. It is so light that wind can blow it out of a measuring box and it can be lost. All mixing of perlite concrete must be done in places protected from the wind.

Moulds for Perlite Concrete

Perlite concrete is suitable for casting by being poured into moulds or for being moulded into blocks by the tamping of a dry mix. Whichever method is used to produce concrete units, moulds are necessary.

Simple temporary moulds in timber or more permanent moulds in steel to produce any desired shapes of moulding are not hard to make. Fig. 2 shows a mould constructed in timber for casting panels for the pig farrowing house shown in Fig. 1. Fig. 10 shows timber moulds used for casting panels for a garage, and Figs. 3 and 5 show permanent steel moulds for casting house wall blocks. Fig. 11 shows a multiple mould for casting four hollow blocks at a time (in this case in ordinary concrete) for house foundations.

The making of moulds is not difficult if it is remembered that the mould must be drawn away from the casting rather than the casting being ejected from the mould. In machine moulding castings are always ejected from the mould, but the amateur can obtain a superior finish on units with less breakages by drawing the mould away from the casting. If the shape of the moulding prevents the use of tapers to allow the mould to come away easily, the mould must be sectionalised so that the parts can be drawn away without interfering with the moulding.

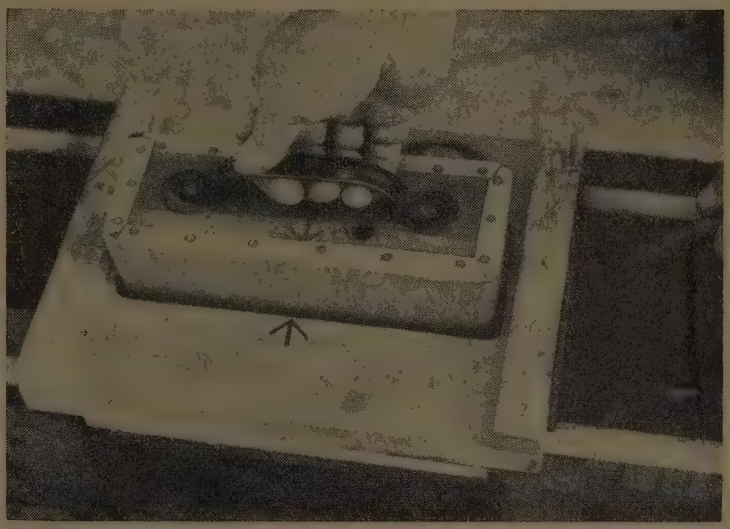


Fig. 15—Withdrawing the core through the profile plate over a block mould. The arrow on the plate is opposite that on the core.

Moulds, if built in either timber or steel, must be robust enough to withstand the forces imposed by the concrete when placed and also sufficiently rigid to resist distortion and warping.

If a number of units are to be cast in poured concrete, it is preferable to arrange the mould so that the base can be retained level on a firm foundation and not moved until all units have been cast, the units as cast being lifted off the mould rather than the mould being moved away from the units. This ensures that the mould is rigid in at least one plane and remains so. This is illustrated in Fig. 10, which shows the rigid base of the mould.

A study of the moulds shown in Figs. 2, 3, 5, 10, and 11 will show that the principle of construction used to support the mould and maintain it true in all planes is to provide main members in both the horizontal and vertical planes to counter forces in either direction.

Fig. 14—Block making pallets made of timber.

Wall Panel Moulds

To make the octagonal pig house shown in Fig. 1, each panel, which was cast in the mould for poured concrete shown in Fig. 2 and which included a bulge for a farrowing rail, had to be cast truly flat with a true bevel on the edges, as eight panels were assembled to form the house. If edge bevels had not been identical on each panel or if the panels had followed any warping or twisting of the mould, they would not have fitted snugly when assembled into a house.

A base was provided which would give rigidity to the side boards in the vertical plane, and rigidity in the horizontal plane was obtained by setting this base on a firm, level concrete floor in exactly the same place for each casting. The absence of projections on these particular castings prevented their being easily lifted from

Fig 16—Steps in Casting Perlite Concrete

A—Applying mould oil to a panel mould to prevent the wet concrete from adhering to the mould.

B—Trowelling concrete in to the mould. The concrete has been mixed to the right consistency.

C—Placing reinforcing of welded steel mesh in the concrete.

D—Screeding the concrete before finishing it off. The straight edge is worked obliquely across the mould to pack the concrete more easily.

E—Finishing the surface of the panel with a steel float.

the moulds, so they were separated from the mould after removal of side and end boards by being turned upside down and the mould was lifted away from the casting.

The mould shown in Fig. 10, also for poured concrete, produced wall panels with a tongue and groove weather seal on the edges. These panels were cast face upward to facilitate float finishing. As the tongues and grooves had to mate accurately on assembly of the panels, the same side boards, moulded to produce the tongue on one side and the groove on the other, were mated before use and used for each casting. These side boards could be removed within 48 hours, the castings being left on the mould base until they could be handled safely.

With the use of two identical mould bases as shown and one set of side boards, the time required for moulding any number of panels could be reduced by half. To maintain the side boards square with the base of the panel and still allow for the bowing of the timber through moisture, they were attached to rigid base members of the mould by steel angle brackets held in place with bolts and wing nuts. The attachment to the base was arranged by clamp as shown in Fig. 13 to allow the brackets to be drawn away from the side boards, the brackets being squared to the mould base with steel packing as shown.

The moulds shown in Figs. 2, 10, and 11 were all constructed principally in timber, as only a limited number of units were required from each mould. However, timber is not a satisfactory material for permanent moulds which have to produce a large number of units.

Permanent moulds should be constructed in steel, which is not subject to warping. Steel moulds will continue to produce identical mouldings indefinitely provided they are maintained and not permitted to deteriorate by rusting.

Use of Steel in Mould Construction

The judicious use of steel can also greatly simplify timber mould construction. For example, with the mould shown in Fig. 11 angle steel has been used for end binding members, as these must maintain a true right angle with the 3in. x 2in. member parallel to the longitudinal axis of the mould to keep the ends of the blocks square with the faces. Steel separators have also been used, as they can easily be withdrawn and "leapfrogged" along the mould for each block.

If a mould has to be split to allow its parts to be drawn away from the moulding, it must be so arranged that the relationship of the parts to each other always remains the same on re-assembly. This can be achieved quite simply by making the main angles rigid, not necessarily in the mould sheathing itself but in the framework to which the sheathing is attached. This can be seen in the steel moulds (Figs. 3 and 5) used for block moulding. These moulds split diagonally by withdrawal of the pins at opposite corners. With the mould in Fig. 3 the front is first drawn away from the moulding, then the back, and the side plates are removed last. The back and front are then re-assembled by the pins being replaced and the end plates are inserted.

The moulds in Figs. 3 and 5 are shown separated in Figs. 4 and 6. The frame angles through which the pins pass to tie the frame together are heavily welded on the corners opposite the pins. The welding rigidly attaches the side angles truly square to the longitudinal angles, so that when the pins are replaced in the opposite corners the moulds are assembled with all angles true.

Moulds are best split at the corners, either diagonally as the moulds in Figs. 3 and 5, or at corners on the same side as the mould in Fig. 11. This permits corners which are not split to be rigidly constructed and so maintain split corners at their correct angles.

Just as a mould for poured concrete must be either built rigidly in itself or placed on a rigid foundation, so block moulds must also sit on a truly flat surface, as this surface will form the bottom face of the block. Pallets constructed in timber (see Fig. 14) are the most suitable for this purpose, as the blocks as moulded can be moved to curing quarters. Enough pallets to deal with the output of blocks between the time of manufacture and safe handling should be provided. As soon as the blocks can be handled safely they can be stacked for curing and the pallets recovered.

All moulds, whether timber or steel or for poured concrete or block making, should be treated on the inside with mould oil to prevent the wet concrete adhering to the mould (see Fig. 16a).

Coring Block Mouldings

To produce clean cored holes when hollow blocks are made certain precautions must be taken in making and using the cores.

Cores should be tapered on all sides about ¼in. for each foot of length to allow easy withdrawal without disturbing the moulding. They must also be provided with means of withdrawing them, such as a handle. All corners must be rounded.

All cores must have means of permitting the entry of air to the core bottom; otherwise the partial vacuum created at the instant the core is withdrawn will cause the wet concrete near the bottom of the cored hole to collapse. This can be accomplished by drilling a hole through the centre of the core. This hole should be fitted with a plug to prevent concrete from dropping in while the block is being cast, the plug being removed before the core is withdrawn.

Wooden cores for blocks made from natural aggregate concrete should be sheathed with a galvanised sheet, as the pressure exerted by ramming gravel or metal chips round the core causes the aggregate to indent the core slightly, which tends to disturb the moulding when the core is withdrawn. This precaution is not necessary when fine aggregates such as perlite-sand blends are being used.

All the above features are incorporated in the core shown in the multiple mould in Figs. 11 and 12. This core is tapered with rounded corners, metal sheathed, and provided with a handle, air hole, and plug. In Fig. 11 the plug is in place ready for the casting of a block.

The corner block mould shown separated in Fig. 6 has a core provided with a handle, taper, rounded corners, and a hole, but is not sheathed, as a perlite-sand blend is used for these blocks.

For the accurate positioning and clean withdrawal of cores a profile plate is necessary to act as a holder for the block when the core is withdrawn. This consists simply of a piece of timber in which a hole is cut the same size and shape as the top of the core. It sits across the top of the mould, being located with battens fastened to the underside so that the position of the hole corresponds exactly with that of the core.

To position the core before moulding a block, the profile plate is placed across the mould and the core lowered through it to rest on the moulding base. The profile plate can then be lifted away from the core, which is held in position with one hand while the first concrete is placed. As filling of the mould and ramming of the block proceed the position of the core can be checked occasionally by replacement of the profile plate.

When casting is completed the profile plate is placed across the mould and the core withdrawn through it. This is shown in Fig. 15, which also shows the operator holding the air hole plug in his left hand.

The clean holes left by cores can be seen in the blocks shown in Figs. 5 and 11. If any discrepancy or unevenness exists in cores when they are made, it is advisable to mark both profile plate and core with an arrow to indicate their relative positions when in use. These arrows can be seen in Fig. 15.

Stages in Casting Perlite Panels

The different stages in the casting of perlite concrete panels are shown in Fig. 16.

Fodder Crop Production on Dairy Farms in the Bay of Plenty

THE initial stages of the development of the Bay of Plenty were characterised by a considerable amount of cropping. In those early days pasture production was low, bush sickness made livestock farming difficult in many places, and crops provided a large portion of the farm income. Large areas of maize were grown, with other cereals, potatoes, and kumaras, as well as supplementary crops for stock feeding. With the increase of phosphatic topdressing of pastures, the use of better strains of grass and clover seed, and the introduction of cobalt as a corrective for bush sickness, there has been a marked decline over the years in the area under crop. The greater use of hay and silage as supplementary feed for stock during a dry summer and during winter has also reduced the need for cropping. In this article, A. V. Allo, Instructor in Agriculture, Department of Agriculture, Tauranga, discusses the place of cropping on dairy farms in the Bay of Plenty today and shows that under certain circumstances the growing of supplementary fodder crops can play a very important part in farm production.

THE main value of fodder crops is in providing feed at a time when pasture growth is insufficient for stock requirements and when hay and silage are inadequate to fill the gap or are not available. In the Bay of Plenty the two common periods of grass shortage are in winter and, less often, in a dry autumn.

In the past the normal perennial ryegrass, cocksfoot, paspalum, white clover type of pasture characteristic of much of the Bay of Plenty has not produced a great deal of growth over winter, so that farmers have had to rely on reserves of hay and silage to carry their stock through this period of low grass production. Since the introduction of short-rotation ryegrass the picture has changed considerably, as this is a grass that grows well over winter if fertility is adequate and grazing is not too severe. The general introduction of this grass into Bay of Plenty dairy pastures would greatly increase winter pasture production on many farms.

Provision for Dry Autumn

In dry summers paspalum is capable of producing, under conditions of satisfactory management, large quantities of good fodder. Only in a really dry summer does paspalum production fall to a low level, and when this occurs the position of the dairy farmer is serious. He may have to draw on supplies of hay and silage conserved for the following winter, and despite this supplementary feeding, production will probably fall and stock tend to go back in condition. Frequently the use of hay and silage during a drought results in a shortage of supplies in the following winter. This means paying high prices for hay or for concentrates or stock will be

HEADING PHOTOGRAPH: A good crop of swedes, the most popular winter crop grown in the Bay of Plenty.

inadequately fed over winter, with a consequent crop of stock troubles in the following spring.

From some aspects a severe autumn drought is more serious than a long winter, and when the two are combined the farmer can be in real trouble.

It is evident therefore that on the majority of the older and more fertile dairy farms in the Bay of Plenty it is more important to crop for a dry autumn than for winter. Many farmers have been reluctant to work up their land for various reasons, but farmers who have had an area of crop available for their stock in a dry season are emphatic that the benefit derived from this crop has been well worth the effort.

Autumn Fodder Crops

The policy of growing an autumn fodder crop can fit in very well with the pasture-improvement programme of a farm. Many farms have paddocks with a rough and uneven surface or have poor and unproductive swards and these could with profit be cropped before they are sown down to high-producing pasture. The advantages of this as compared with a grass-to-grass policy are numerous. The turf, particularly that from paspalum-bound pastures, has time to rot down and is thus thoroughly incorporated in the soil, filled-in depressions have a chance to consolidate, and the firmer and deeper tilth which results from these operations is more satisfactory for the establishment of the ryegrasses.

The best autumn fodder crop is white-fleshed turnips and many farmers have found that an area in this crop has helped to maintain production during a dry summer and early autumn. White-fleshed turnips should be sown on a well-prepared seed-bed from early October onward, and it is advisable to sow both the early maturing N.Z. York Globe and the later N.Z. Green Globe. The third of the paddock near the gate should be sown in the York Globe variety and the balance of the field in the Green Globe. Both areas should be sown at the same time and the Green Globe will be ready for feeding off after the York Globe has been used. It is suggested that to provide fully for a dry summer and autumn an acre of turnips should be sown for every 10 to 15 cows milked.

Once the crop has been fed off, a light surface working with discs and harrows, followed by a rolling where a roller is available, is normally sufficient to produce a satisfactory seed-bed for the following pasture. If a paspalum-dominant sward is ploughed for turnips, all the paspalum will not be lost if no ploughing is done after the turnip crop.

Occasionally autumn fodder crops of greenfeed maize, millet, ryecorn, chou moellier, or rape are grown, but it is doubtful whether any of these is as satisfactory as turnips.

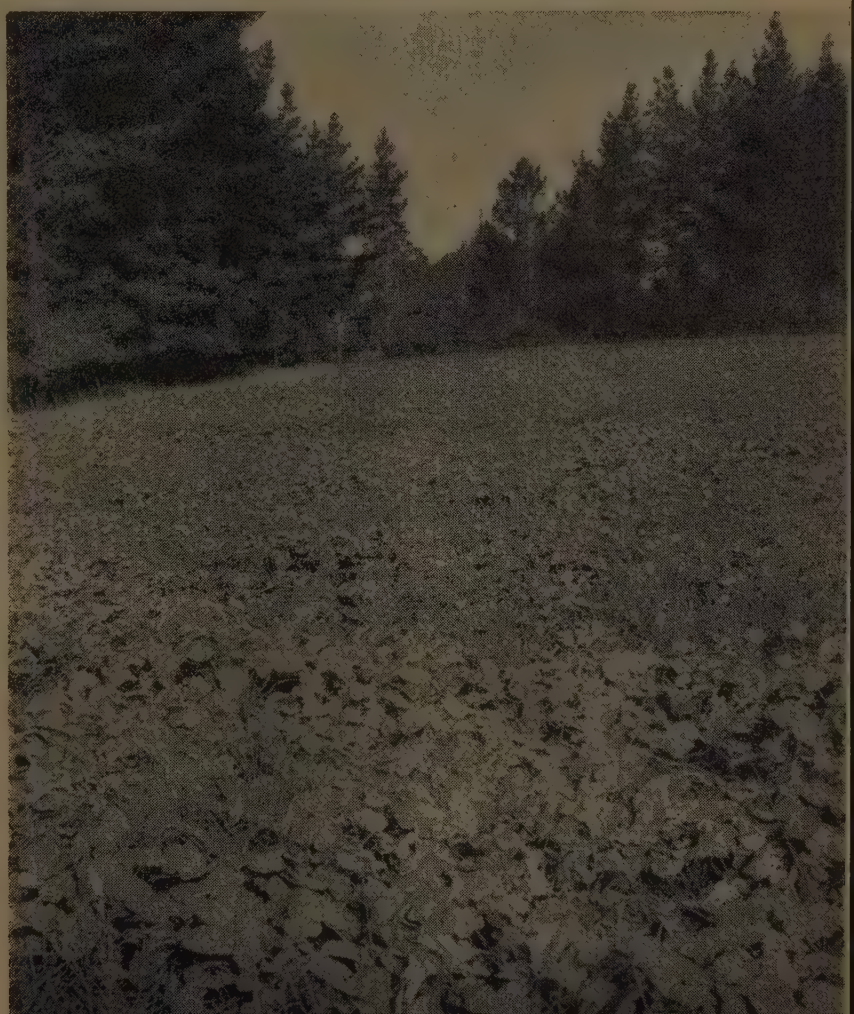
The growing of a crop of turnips for summer and autumn fodder is also a very good way of introducing paspalum on to a farm that is lacking this valuable grass. The inclusion of 6lb. of paspalum seed per acre in the turnip seed will result in the field having quite a good sprinkling of paspalum through it by the time the turnips have been fed off, after which the land can be lightly worked down and sown with the usual grass seed mixture.

Sowing Crops in Rows

Some farmers dislike the idea of autumn cropping because of the weed problem, and undoubtedly there have been instances where heavy weed growth has ruined otherwise promising crops. The answer to weeds is largely found in early and thorough working of the seed-bed and the avoidance of too many crops in succession in the same paddock. Where weeds are generally widespread, as they are on the soils of the Rangitaiki Plains, for example, more attention should be given to the sowing of crops in rows so that inter-row cultivation can be done. Contrary to popular opinion the yields from a crop such as turnips grown in wide rows and inter-cultivated is as heavy as if not heavier than that from a broadcast crop, where no cultivation can be done after sowing down. If it is necessary to hand feed, much less effort is needed in pulling and loading a cultivated crop, as it should be comparatively free of weeds and the bulbs will be larger.

Aid to Weed Control

Cropping can be a very useful method of controlling some weeds. Though hormone weedkillers are normally used for ragwort control, two crops taken out of a paddock badly infested with ragwort will help materially in getting rid of this weed. Cropping may also help to eliminate much of the blackberry on a field infested with this weed.



Swede crop sown on land previously in sodbound paspalum. Fresh growth of paspalum has occurred.

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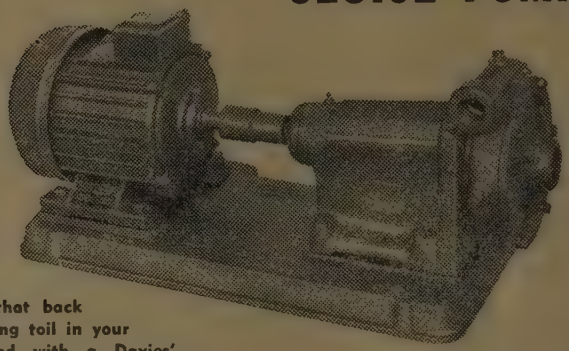

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FODDER CROP PRODUCTION ON DAIRY FARMS IN BAY OF PLENTY

The best fodder crop to grow in the Bay of Plenty for summer and early autumn feed is white-fleshed turnips.

Cropping for Winter Feed

Cropping for winter feed is receiving increasing attention in the Bay of Plenty. It has a place particularly for the man on fairly new country on which adequate supplies of hay and silage are not available because of lack of pasture area or of paddocks suitable for mowing. It is, however, not uncommon for farmers on older country to put in a winter crop.

Swedes are the most popular winter crop in the Bay of Plenty. They are cheap to grow and do very well, are easily fed off, and stock winter well on them provided access is given to a run-off of rough feed or hay is supplied to balance the diet. Generally, too, it is a sound practice to sow 3oz. to 4oz. of chou moellier per acre with the swedes. Such a light sowing does not compete with the swede crop, and besides providing variety in feed for the stock, the chou moellier through its tall growing habit gives some control over weeds.

In the development of new country it is a fairly common practice to sow down an area of virgin land in temporary pasture, mainly clovers. After 2 or 3 years the area is worked up and sown in swedes. However, neither swedes nor any other crop will give a payable yield when sown down on virgin pumice country, though they will give good results when grown on pumice country that has been in pasture for a year or two.

Sowing Down after Crop

After the swede crop has been used the paddock may be sown down to grass in spring or a crop of soft turnips may be taken for feeding off in the following summer and autumn. The latter practice is the more popular, as it permits the sowing of grass seed in autumn and the provision of a useful second crop.

Swedes

The most popular variety of swede is N.Z. Superlative, followed by N.Z. Crimson King. Seed should be sown at 1lb. per acre when broadcast or ½lb. to ¾lb. per acre when drilled, at the end of November or in early December, so that the crop may become well established before dry weather sets in. Provided the weather is satisfactory and the soil is moist, sowings can be made in late December and even into January.

Occasionally a sowing of 6lb. of paspalum and 4lb. of cowgrass per acre is included with the swede seed, especially on land under development. The crop is fed off during the following winter and the paspalum and cowgrass provide useful grazing until the following autumn, when the balance of the grass seed mixture is oversown.

Chou Moellier

Another popular crop for winter feeding is chou moellier, which will grow well in fertile soil. It is recommended more for the older-settled areas. It is a particularly useful crop in that if it is sown in early October, it can be fed off in autumn if required, after which it will produce a second crop of leaves for late winter and spring. If not needed in autumn, it will hold on well throughout winter and even into spring, when it can be fed to the early calvers.

Turnips

White-fleshed turnips are frequently grown for winter feed, particularly after a dry summer and autumn when reserves of hay and silage are low or where swedes have been a failure. Very good crops are obtained, provided sowing is done in March or early April. If the crop is sown early, the Green Globe variety should be used, but if sowing is delayed until April, York Globe is better. On soils of low fertility, where turnips and Italian ryegrass do not produce very well, ryecorn has been found to give good results, staying green and palatable when other crops have failed.

Italian Ryegrass

After the dry autumn of 1954 a number of farmers worked up paddocks in autumn and sowed them down with 30lb. to 35lb. of Italian ryegrass per

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acre. Where soil fertility was reasonably high a large bulk of fodder was available during winter and spring, the paddocks being worked up again for turnips in late September.

There are still many farmers who crop for winter feed for their pigs. Very little winter feed should have to be grown for pigs if endeavours are made to have sows farrowing in May and November, as then only the sows would need feeding over winter. However, as most farmers in the Bay of Plenty have sows farrowing in early spring and autumn, they have to make provision for wintering varying numbers of stores.

Maize

For many years maize was the main crop grown for winter pig feed. It was easy to grow and to store and pigs wintered well on it, provided a protein supplement was fed. Because of increasing difficulty in obtaining labour to harvest maize there has been a steady decline in the total area devoted to the crop and individual crops are now usually of a few acres. Good crops of maize can still be grown, provided soil fertility is adequate, suitable seed is sown, and the crop is kept clean. Kumi-kumis are usually grown in the maize crop to increase further the quantity of pig feed available on the paddock.

A few crops of artichokes are still seen throughout the district. The provision of such a crop should be encouraged, as it is easy to grow and simple to use.

Fodder Beet

In recent years many inquiries have been received about the growing of fodder beet, a plant which is a cross between sugar beet and mangel. It has a high feeding value, is easy to harvest, and pigs do well on it, but it is a crop demanding a good deal of attention to keep weeds under control. It is grown in the same manner as sugar beet or mangels, but is superior to the former in that it is easier to harvest and gives bigger yields, and it has a higher feeding value than mangels and does not need ripening.

Carrots are also a popular winter crop for pigs. Though they have a lower feeding value than fodder beet, the fact that power kerosene may be used to kill weeds in the early stages of the crop makes carrots a popular crop with farmers, who may not have time for the hand work entailed in growing fodder beet.

The decision whether or not to crop must ultimately depend on the individual farmer and on the type of property he has. It depends on the topography and soil type, on the class of pastures, soil fertility, and amount of hay and silage available. In the Bay of Plenty cropping is largely a means to an end—to better pastures, better-fed stock, and better production.

A crop of chou moellier and swedes such as this is of great value for winter feed.

"Farm Machinery and Tractors": R. H. Cochrane

THE second edition of this book, published 3 years after the first edition, might well have devoted more space to the use of machinery for New Zealand grassland farms, particularly the conservation of grass silage. Mr. Cochrane has, however, described a wide range of farm machinery, and the book is admirably arranged for quick reference and is provided with exceptionally clear diagrams.

The chapter on care and maintenance has been rewritten and enlarged and another chapter, "The Economics of Farm Mechanisation", has been added, and both the alteration and the addition have increased the value of the book.

—*H.W.T.E.*

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Care of Livestock during March

Contributed by the Animal Research Division

IF losses from pulpy kidney are usually experienced in lambs under 6 weeks of age, they can be prevented only by the ewes being vaccinated. If ewes have not been vaccinated in previous years, the first dose should be injected when they are crutched before tupping and another dose should be injected just before lambing. Ewes which have been vaccinated in previous years require only the pre-lambing injection. Vaccination should be done in temporary yards. Syringes should be boiled before use and needles should be kept in methylated spirit and wiped and changed each time the syringe is filled. Vaccination of ewes will not be effective in preventing losses in lambs over 6 weeks of age. Where such losses occur it is necessary to vaccinate the lambs themselves.

PULPY KIDNEY VACCINATION OF EWES

Blowfly strike is likely to occur in showery autumn weather when the humid conditions do not allow rapid drying of the fleece. Constant supervision is necessary to ensure that all cases are treated in the early stages. The wool should be sheared so as to leave a clean margin all round the strike, and a careful watch should be kept for narrow tracks leading to areas some distance from the original strike. The affected sheep should be treated with a good non-irritant dressing and the maggots should be collected and destroyed, as if they are allowed to fall to the ground, they are capable of hatching into flies. Jetting with preparations containing DDT, BHC, or dieldrin will protect sheep against blowfly strike for several weeks.

BLOWFLY STRIKE IN SHEEP

Calves should have access to good hay at all times. It is particularly valuable after the first autumn rains, and will greatly assist in preventing the severe scouring which sometimes occurs after the grazing of lush, rapidly growing pasture. Calves must be rotated through the paddocks at intervals of a few days. Set stocking at this time of year is bound to result in scouring, unthriftiness, and some deaths.

FEED HAY TO CALVES

If dairy cows are well fed, they do not need more than 60 days' rest between lactations. New Zealand Dairy Board statistics show that the average length of lactation in New Zealand is only 248 days. Production could be materially increased by milking cows longer. A good rule is to continue milking a cow while she is giving more than 10lb. of fat per month, unless she is within 60 days of calving.

LENGTH OF LACTATION PERIOD

A cow should never be culled for sterility without being examined for pregnancy by a veterinary surgeon. Many cows thought to be empty have proved to be in calf when slaughtered at the works. Presence or absence of heat is not an infallible guide in diagnosing pregnancy. Good producers which are empty may be worth keeping, as about 80 per cent. of such cows hold when mated in the following season.

CULLING OF EMPTY COWS

Many cattle die from lead poisoning each year. Common sources of lead on the farm are old paint tins, discarded scraps of metallic lead, and old batteries. These should be buried or disposed of in such a way as to prevent cattle from having access to them. Calves frequently suffer from lead poisoning through licking painted surfaces, and care should be taken to prevent their doing this.

LEAD POISONING IN CATTLE

Sleepy sickness, which in some seasons causes severe losses in pregnant ewes, is due to a sudden drop in the food supply just before lambing. On many farms the only feasible way of avoiding this is by shutting up pasture in autumn for grazing by the ewes for 3 weeks before lambing. Short-rotation ryegrass is particularly valuable for this purpose, as it continues to grow during winter, even in Southland.

SLEEPY SICKNESS IN EWES

Dairy Produce Graded for Export

THE following figures showing quantities of dairy produce graded for export during December and for the 5 months ended 31 December 1955, with comparative figures for the same month and 5 months of 1954, have been compiled by the Dairy Division of the Department of Agriculture from figures supplied by divisional officers at the various grading ports:—

BUTTER

Period	Creamery (tons)	Whey (tons)	Total (tons)	Percentage inc. or dec.
December 1955	23,900	395	24,295	—
December 1954	22,038	428	22,466	—
Increase or decrease ..	+1,862	—33	+1,829	+8.141
5 months ended 31/12/55	97,683	1,625	99,308	—
5 months ended 31/12/54	92,952	1,697	94,649	—
Increase or decrease ..	+4,731	—72	+4,659	+4.922

Butter in store at 31 December 1955 was 28,073 tons

CHEESE

Period	White (tons)	Coloured (tons)	Total (tons)	Percentage inc. or dec.
December 1955	11,745	2,318	14,063	—
December 1954	12,068	3,698	15,766	—
Increase or decrease ..	—323	—1,380	—1,703	—10.802
5 months ended 31/12/55	41,735	6,449	48,184	—
5 months ended 31/12/54	42,875	12,056	54,931	—
Increase or decrease ..	—1,140	—5,607	—6,747	—12.283

Cheese in store at 31 December 1955 was 23,360 tons

If these figures are converted into butterfat equivalent, there is an increase of 1.356 per cent. in butterfat graded for the 5 months as compared with the corresponding period of the preceding season. The above figures refer only to butter and cheese graded for export, and owing to diversions which may take place from time to time they are not necessarily a true indication of production trends.

Pasture Production and Management

Seasonal Notes by the Extension Division

PASTURE production for the ensuing 12 months can be greatly influenced by autumn pasture management. Attention should now be given to topdressing programmes, renovation of inferior swards, plans for closing fields for winter feed, and rotational grazing practices on which such closing depends. Autumn topdressing is especially valuable in increasing late-autumn grass growth and thus increasing winter carrying capacity. Oversowing of run-out swards requires careful consideration, as conditions must be suitable if oversown grass seed is to establish; the practice is generally most successful on swards where white clover is dominant and where fairly drastic cultivation has been carried out to prepare a suitable seed-bed. If pastures are completely run out and weedy, the land should be ploughed and cropped before resowing. The orderly closing of fields for autumn- and winter-saved grass depends on the adoption of a suitable rotational grazing system which will allow the successive closing of fields from late autumn to midwinter.

MOB STOCKING ON HILL COUNTRY

MOBBING the ewes at weaning time and grazing them in mobs through summer, autumn, and winter to control their condition and for better pasture management is rapidly becoming standard practice on an increasing number of North Island hill country farms. When the ewes are spread out over the paddocks they do untold damage to pastures by over-grazing favoured areas, particularly under dry conditions, and they neglect the more difficult and shady faces, which run away to unpalatable and useless top growth. By putting the ewes into mobs (generally the larger the mobs are the better is the pasture management achieved) the farmer immediately can control their condition. He can keep ewes on short rations immediately after weaning to keep down their condition and can save some good feed on the better pastures to flush them a few weeks before the rams go out. After tupping he can again keep them on short rations, saving feed from the autumn flush of growth to provide ewes with that extra feed they need to bring them up in condition just before lambing.

With the ewes in one or two mobs the farmer can also do a great deal to improve the pastures as a whole. During the periods of keeping ewes down in condition paddocks can be given a good clean up and cattle made to finish the job. This cleaning up by big mobs of sheep followed by a reasonable spell as the ewes go round the farm has had an astonishing effect on the pastures of farms where this method of grazing management has been practised for a few years. More and better feed is available in winter than under set stocking with no spell, when parts of paddocks become overgrazed and big areas go into winter carrying dry and rotting rubbish. Mobbing the ewes and intelligent management have resulted first in better pastures, next in improved wool quality and increased wool weights, and in time in a decided increase in carrying capacity.

—E. C. AYSON

* * *

SEED MIXTURES IN THE SOUTH ISLAND

WHEN a pasture seed mixture for sowing in the South Island is planned several points must be borne in mind: First, whether the class of land to be sown is heavy, medium, or light; secondly, the purpose for which the pasture will be used; and thirdly, whether it is to be used as a special-purpose pasture designed to overcome feed shortages at a particular time of the year. In any case the number of grasses and clovers available is limited to perennial ryegrass, short-rotation ryegrass, cocksfoot, timothy, white clover, red clover, and subterranean clover. Italian ryegrass and lucerne are used more as special-purpose pasture species.

Each grass and clover has its particular period of growth. Short-rotation ryegrass is an autumn, winter, and early-spring producer, perennial ryegrass grows best in spring, early summer, and autumn, and timothy and cocksfoot grow best in late spring and summer. White clover grows vigorously in spring and autumn and red clover grows in summer. Subterranean clover is an annual; it germinates in autumn and establishes, survives the winter, produces well during spring, runs to seed and dies off during the dry part of the year from November-December to February, and re-establishes in March-April.

Seed mixtures for grazing on heavy land are designed to give the best spread of feed; for example, perennial ryegrass at 15lb. to 20lb., short-rotation ryegrass 10lb., timothy 2lb., white clover 3lb., and Montgomery red clover 2lb. On medium soils timothy should be replaced by cocksfoot at 4lb. to 5lb., white clover could be reduced by 1lb., and Montgomery red clover increased to 3lb. to 4lb. The quantities of the ryegrasses remain the same. On light soils in areas of low rainfall which dry out in summer short-rotation ryegrass could be deleted, cocksfoot increased, white clover reduced, and subterranean clover included. A useful mixture is perennial ryegrass at 10lb. to 15lb., cocksfoot 4lb. to 6lb., subterranean clover 4lb., and white clover 1lb. Alternatively 3lb. of Montgomery red clover could be added to the mixture and cocksfoot reduced or left in as desired.

For more temporary pastures on light land or on medium land where mixed cropping is done 15lb. to 20lb. of short-rotation ryegrass or Italian ryegrass could be substituted for perennial ryegrass and cocksfoot, and subterranean clover at 4lb. and white clover at 1lb. could be included. To overcome summer feed shortage and reduce grass-grub attack on light lands, lucerne (10lb. to 12lb.) and cocksfoot (1lb.) have given good results. For seed production simple mixtures must be sown; for example, short-rotation ryegrass at 20lb. to 30lb. and white clover 2lb. to 3lb., or perennial ryegrass and white clover at the same rates. It is unwise to add Montgomery red clover to a ryegrass-white clover mixture designed for seed production, because when white clover is ready for harvesting red clover is growing and difficulties are encountered at harvesting. Cocksfoot (5lb. to 8lb.) and timothy (3lb. to 5lb.) are often sown with 2lb. to 3lb. of red clover.

With all seed mixtures there is a certain amount of latitude. In areas of higher rainfall and fertility heavier seedings are generally sown than in areas of medium to low fertility under a lower rainfall. Perennial ryegrass and white clover are the main species, others being added according to soil fertility and rainfall.

With the high prices ruling for good grass and clover seed farmers may be tempted to sow cheaper, uncertified lines. Certified seed is the hallmark of quality and only good seed of known purity and germination is certified. Uncertified seed is dearer in the long run, as usually the pasture runs out more quickly and weed seeds are brought in.

—T. G. SEWELL

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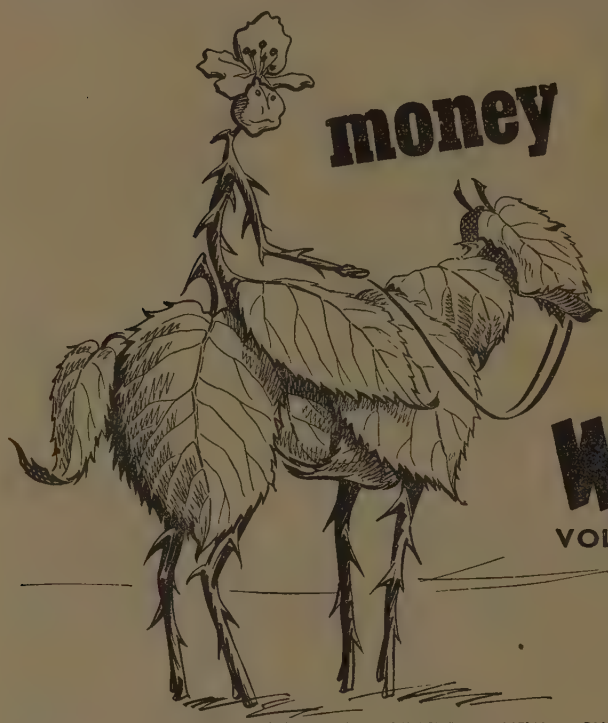

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Common Ailments in Household Poultry

LOSS or illness of birds in the small flock is very often due to one or other of the miscellaneous troubles which may affect laying birds apart from the well-known diseases such as coccidiosis or tuberculosis. A short description of a number of these common ailments is given in this article by M. E. White, Poultry Instructor, Department of Agriculture, Levin.

THE frequency with which upsets of the oviduct or egg tract occur in the laying bird has led to the apt designation of these conditions as "occupational hazards". The strain imposed on birds laying heavily exposes them to breakdowns of organs or parts of the system.

Prolapse of the Oviduct

The protrusion of a small or large portion of the oviduct through the vent is called a prolapse or blow-out. The condition may arise from the presence of an over-large or broken egg in the oviduct, the strain of heavy laying, highly stimulating food such as poultry spices, or severe fright. The prolapse is usually evident as a red mass at the vent.

Treatment: If the bird is observed soon after the prolapse has taken place, prompt treatment may be successful. The prolapsed portion of the oviduct should be washed with boiled water to which has been added 1 teaspoon of common salt to each pint and carefully replaced with the fingers. Some of the salt solution when cold should then be injected into the vent to reduce the swelling of the tissues and a few silk or cotton stitches made across the vent to ensure that there is no recurrence of the prolapse.

The stitches can be removed in a few hours; as an alternative to the insertion of stitches a pad of cotton wool soaked in cold water may be tied over the vent area.

The bird will often go off lay for some time, but usually recovers. There is a risk of this trouble recurring when the next egg is laid.

Egg Bound

Though an egg-bound condition may be brought about by a number of factors such as the presence of an over-large egg in the oviduct, obstructions due to tumours, or even a form of fowl paralysis, its occurrence is not as frequent as appears to be thought. The affected bird, usually a young pullet, shows restlessness and by its frequent visits to the nest a desire, but inability, to lay. Straining may eventually lead to prolapse of the oviduct.

Treatment: The application of a little olive oil or liquid paraffin on the end of a feather to the inside of the vent is sometimes of value. Holding the bird over a vessel containing hot water for a few minutes is successful in other cases, as steam helps to relax the lower end of the egg tract.

If the egg is visible or can be felt with a finger, an attempt should be made to remove it. To do this the egg usually has to be broken and great care is necessary not to injure the bird. All the pieces of shell must be removed and the passage douched with salt solution prepared as already described.

Egg Peritonitis

The sudden death of birds in good condition and laying well is frequently due to egg peritonitis. Death may be preceded by symptoms of dullness, darkening of the comb, and panting.

Post-mortem examination of the bird discloses a hard yellowy white mass in the abdomen or a shiny fluid covering the organs and the peritoneal lining of the cavity. The presence of this material in the abdomen indicates that an egg yolk has either failed to enter the oviduct or has been pushed up out of it by reverse movement of the walls of the oviduct. It may also arise from the rupture of the oviduct through blockage by eggs which fail to pass downward.

Peritonitis probably arises from secondary bacterial infection. The condition fairly commonly occurs in birds which are heavy layers.

Prevention: No treatment can be given; preventive measures include avoiding a fattening diet, plenty of exercise, and breeding only from hens with good body size.

[*Niederer*

Bumble foot on a hen.

"Waterbag" or "Penguin Disease"

"Waterbag" or "penguin disease" is merely a convenient name for a disease in which the fowl assumes an upright position and walks or waddles like a penguin or duck. In many cases the abdomen is enlarged and filled with fluid. The condition may arise from tuberculosis, tumours in the abdomen, ovarian cysts, or egg peritonitis.

Bumble Foot

Bumble foot is a well-known condition common in household poultry flocks and occurring in a few birds on

Reminders for March

ADULT hens are due for their annual moult and will be out of production for a period of 10 to 12 weeks. Unless these birds are required for another laying season, they should be disposed of when they start to moult.

The new season's pullets will be coming into lay, and quite often these birds lay soft-shelled and double-yolked eggs at the start. This should not cause anxiety, as usually after a week or two of production normal eggs are laid.

Before the new season's pullets come into production they should be dewormed with carbon tetrachloride and each bird should be given a 2 c.c. capsule. These are available from egg floors, merchants handling poultry requisites, and chemists. The laying quarters should be clean, with adequate litter material on the floor. A periodical check should be made for red mites and body lice. Red mites are found under the perches and fittings, and if they are seen, the affected parts should be painted with creosote or a solution made up by mixing sump oil and kerosene. When body lice are found on birds, particularly in the region of the vent, the upper sides of the perches should be painted with nicotine sulphate just before the birds perch. The treatment should be repeated about 10 days later to destroy any lice from "nits" (eggs) which hatch out after the first application.

commercial farms. The initial cause is usually a bruise or cut on the ball of the foot which allows entry of infective bacteria and culminates in abscess formation.

The bird becomes lame and there is obvious swelling of the ball of the foot. The pain may cause the bird to cease laying.

Treatment: If a scab is present under the foot, it should be removed and the pus in the swelling squeezed out. Since the condition is really an abscess, hot water or a poultice may have to be applied to soften it before the pus is ejected. If lancing is required, a fairly deep cut with a sharp razor blade will release the contents of the swelling. Pressure should be applied to the swelling to squeeze out the yellow core, as otherwise healing will not take place.

After being cleaned out the affected foot should be bathed with a warm antiseptic solution and bandaged. If the bandage is covered with stockholm tar or shellac varnish, it will remain firmly in position for 2 or 3 days. The bird should be isolated for a few days to assist recovery.

Detailed Information

The disease conditions described in this article are only a proportion of the troubles that can occur. Further information on these and other diseases is readily available through the Veterinarians and Poultry Instructors of the Department of Agriculture. Bulletins giving fuller details of diseases are obtainable from local offices of the Department.

"DISEASES and Pests of Peas and Beans in New Zealand and Their Control": Seedsmen, market gardeners, and enthusiastic home gardeners will find this bulletin a handy reference to fungous, bacterial, and virus diseases and physiological disorders of peas and beans in New Zealand. Additional sections deal with insect pests and the application of plant therapeutants.

Each disease or insect pest is well illustrated and described. The practical measures for control are set out clearly. Handy reference tables give concentrations of therapeutants to suit both the commercial grower and home gardener.

—I.G.M.F.

New Zealand Department of Scientific and Industrial Research Bulletin No. 114. 9s. 6d.

Manuka Blight on Ornamental Manukas

THE infestation of manuka species that has become known as manuka blight was found about 2 years ago on three varieties of ornamental manuka in the Hastings district. All the infected trees were many miles from wild manuka and it is impossible to state how they became infested, but wind cannot be overlooked as the possible agency of spread of the disease.

Horticultural varieties found attacked in Hastings were *Leptospermum keatleyi*, *L. nicholsi*, and *L. martini*. *L. keatleyi* was infested in varying degrees in three different localities.

A description of the scale insects and the fungus associated with manuka blight was given in an article by J. M. Hoy in the December 1954 issue of the "Journal".

Home gardeners may first identify the pest by the sooty mould similar to that often found on citrus trees and passion vines. Associated with the sooty mould is the insect which inhabits the stems of the plants and appears not unlike a minute, slender scale. The greyish white sac in which the female shelters makes it quite conspicuous. However, most of the infestations on these horticultural varieties at Hastings occurred on the insides of the plants and were not apparent from a few yards.

Control

Excellent control on some of the plants was achieved with 1 teaspoon of DDT 50 per cent. wettable powder plus 1 teaspoon of nicotine sulphate 40 per cent. to each gallon of water. A commercial wetting agent would assist in obtaining good coverage.

—C. L. NAPIER, Horticultural Instructor,
Department of Agriculture, Palmerston North

Trees on the Farm

Thinning the Woodlot

IN the establishment of a woodlot the trees are planted comparatively close together for several reasons: To obtain a leafy canopy as soon as possible and so bring about a forest climate, to smother competing weed growth quickly, to restrict the formation of branches, and to encourage height growth. However, as the trees grow they require more and more room both for crown and roots and, if they are left untended, a struggle for supremacy sets in. At this stage the wise forester carries out thinning, described in this article by W. H. Jolliffe, Extension Forestry Officer, New Zealand Forest Service.

THE main purpose of thinning is to afford more space for crown development (in rich sites and those with a high rainfall) or more space for root development (on poor sites, especially those with a low rainfall). However, the purpose may be to slow down height growth and to encourage diameter growth as may be necessary in, say, windy sites. In a mixed stand the thinning may aim at the removal of one of the component species or at the production of a more even mixture of them.

Usually dead, dying, or diseased trees are removed first and then misshapen ones until a stand of the desired density is achieved. The process should be gradual (spread over a number of years or periods) and no attempt should be made to reduce the stand to its final crop in one operation, because if this is done severe wind damage may result and an influx of weeds can certainly be expected.

In setting out to thin it is a good plan to mark the trees before any cutting is done. Marking should be done with a dab of paint, always on the side from which anyone would naturally approach the trees. The common practice of blazing trees is dangerous because if there is any delay in felling, the place where bark has been removed can provide entry for a disease or insect pest.

Degrees of Thinning

Different species require different degrees of thinning and generally the more light-demanding species require more room than do shade-tolerant ones. For instance, an earlier and heavier thinning would be made in stands of poplars, ash, oaks, larch, or radiata pine than in those of the cypresses, redwood, or Douglas fir.

▼ A 34-year-old stand of *Pinus radiata* which has been neither pruned nor thinned.

A well-managed 26-year-old stand of *Pinus radiata* which ▼ has been thinned. The felled trees have been cut into post lengths ready for peeling before creosoting.

THINNING THE WOODLOT . . .

Trees felled for removal should be cut as near the ground as possible. The lower the stumps are the less breeding space there will be for harmful pests and the fewer obstacles there are to snigging operations. Usually, too, the trees removed will be usable, if not for poles or posts, at least for firewood, and the lower part of the trunk contains a bigger volume of wood than any other part.

Where the felled trees are snigged out to the open, whether by horse, tractor, or by manpower, care should be taken to avoid damage to the bark of nearby trees. Along a snig lane the standing trees should be protected by the use of some sort of guard; branches are useful.

CURRENT WORK

The preparation of the planting site should be taken in hand at this time of year. On ploughable land one or two furrows turned along the planting lines will be well worth while. This practice allows the ground to sweeten, helps to combat early weed growth, and makes the subsequent planting easier and quicker.

Scrub-covered Land

Scrub-covered land entails considerable extra work, which can be tackled in one of three ways. The simplest method is for all scrub to be felled in summer and burnt in autumn, leaving a fairly clean surface on which to plant.

Another way is to cut lines through the scrub at the desired distance apart (from 6ft. to 12ft.) and burn it. The result is usually a fairly clean burn in the lines where the fallen material lies and a lighter burn in the intervening standing material, thus giving some protection to the young plants.

A third method is to cut lines without burning. This gives the most protection to the young plants, but there are the disadvantages of an increased fire hazard and the possible necessity of having to open up the lines for 1 or 2 years after planting to save the young trees from being choked. Normally the choice of method will depend on how exposed the site is.

All photographs by New Zealand Forest Service.

Influence of Organic Manures on Occurrence of Black Root Rot in Hops

By R. H. J. ROBORGH,

Senior Plant Breeder, Hop Research Station, Department of Scientific and Industrial Research, Riwaka

BLACK root rot caused by a soil fungus (*Phytophthora cactorum*) is seriously threatening a substantial part of the hop gardens of the Nelson district. Trials which are still proceeding indicate that the high incidence of black root rot might be caused by dried blood or meat and bone manure in the commercial hop manure.

TO investigate the effect of nutrition on the occurrence of this disease in the field a simple nitrogen, phosphorus, potash trial with three replications was laid out in a heavily infected commercial garden at the beginning of the 1953-54 season. Normally in this garden between 30 and 40 per cent. of plants are killed by root rot each year and have to be replaced.

Nitrogen was supplied as sulphate of ammonia, phosphate as superphosphate, and potash as sulphate of potash. The rate was adjusted to give the same amount of these elements per acre as is in ½ ton of hop manure (No. 2 mixture), which is the normal dressing of a commercial hop garden. (Hop manure mixture No. 2 contains superphosphate 27.5 per cent., sulphate of ammonia 15 per cent., sulphate of potash 22.5 per cent., dried blood 15 per cent., and meat and bone 20 per cent.)

Results of Trial

At the beginning of the 1955-56 season, 2 years after the first annual application with the three artificial fertilisers, not more than 7 per cent. per year of hills from the trial plots had been replanted. Over the same period more than 30 per cent. of hills per year had died from root rot in the surrounding garden, which was manured with the hop manure.

These results suggest that the greater incidence of root rot in the commercial garden is connected with the organic manures—dried blood and/or meat and bone—in the commercial hop manure. It is suggested that these compounds act through influencing the living conditions of the fungus rather than by influencing the resistance of the hop plant.

Confirmatory trials have been laid down and results will be reported later.

Greenfeed Cereals

THOUGH improved pastures have resulted in less importance being placed on greenfeed cereals in recent years, they still play a vital part in supporting pastures in late autumn, winter, and early spring. Greenfeed cereals will produce maximum results after a summer fallow or after a crop such as peas, when the nitrogen status is high, but they can be fitted into the rotation at almost any stage. Most frequently they follow cereal grain crops.

Cultivation need not be intensive and the seed-bed is best left rubbly on top. After grass, ploughing is preferable, but on stubble land or after peas and rape discing and harrowing are normally sufficient. Stubble is best burnt off.

A variety of cereals is available to suit different conditions. Algerian oats provide a good all-purpose greenfeed, but Duns are more suitable in the colder southern districts. Gartons may be used to provide a large bulk of growth early, but recovery after grazing is poor. Seeding rates vary between 2½ and 3 bushels per acre.

Cape barley is the most popular of the barley varieties. It gives rapid initial growth with quite good recovery, but is not as resistant to frost as are oats. Black Skinless is similar to Cape, but provides somewhat more rapid growth. Wong barley gives excellent recovery after repeated grazing and is suitable from Marlborough north. Seeding of this variety may be reduced to 1½ bushels per acre.

Ryecorn, at similar seeding rates to those for barley, also gives excellent recovery after repeated grazing. It is particularly suitable for the colder southern districts.

All greenfeed cereals are normally drilled with 1 to 1½cwt. of superphosphate per acre.

—*J. P. BEGGS,*
Instructor in Agriculture,
Department of Agriculture,
Blenheim

Sheep Dog Trials

ADVICE of the dates and venues of the North Island and New Zealand Sheep Dog Trial Championships in 1956 has been received from Mr. R. Fox-Rogers, secretary-treasurer of the North Island Sheep Dog Trial Association (Inc.), 8 Ellison Road, Havelock North (tel. 2301, Hastings). They are:—

North Island Championships: Beginning 5 June, conducted by Main Trunk Centre at Te Kuiti.

New Zealand Championships: Beginning 12 June at Blenheim.

Farm Management Survey of South Otago Downlands

CONSIDERABLE scope for increasing production from existing ploughable country was disclosed by a survey of an area of the South Otago downlands made by officers of the Department of Agriculture. Information gathered during the survey is analysed in this article (the first part of which appeared in last month's "Journal") by A. H. Mouat, Field Economist, Department of Agriculture, Dunedin.

FOR a fuller appreciation of this farm survey consideration must be given to such economic aspects of farm management as farm income, farm expenditure, owner surplus, capital investment, and farm indebtedness, which are of considerable value in assessing the achievements of the farmer. The division of farm capital into the main components of land and improvements, livestock, and plant and machinery is shown in Table 11.

Plant and Machinery

Based on resale value the value of plant and machinery, including tractors, trucks, and farm implements, averages £1661 a farm for Group A, £2469 for Group B, and £2964 for Group C. Powered machinery, mainly tractors and trucks, represents about 60 per cent. of this value; slightly more (62 per cent.) on the smaller farms and slightly less (56 per cent.) on the larger ones. The details of tractor power in the three groups are shown in Table 12.

For every three tractors on wheels on the downlands there is one tracklayer. There are more tracklaying tractors on the larger farms and the horsepower of tractors tends to rise as the size of farm increases. Half the farms in Group C have more than one tractor. The popular tractor on the downlands is one of 20 to 25 rated drawbar horsepower on either wheels or tracks. Total tractor horsepower on mechanised farms increases with farm size from 26.4 rated d.b.h.p. in Group A to 38.5 in Group B and 39.8 in Group C.

A wide range of farm implements is necessary on the downlands farms for the cultivation and cropping that is required. The popular ploughs are the double-furrow digger and the plain mouldboard type of 3 or 4 furrows; single-furrow swamp ploughs and disc ploughs are less common. Tandem discs, harrows, cultivator, 2- or 4-row ridger and scuffler, power mower, roller, limesower and top-dresser, trailer, and drill are found on most farms. Few farms possess full haymaking equipment, as on most farms hay is baled by contractors. Half the farms of over 700 acres have a combine harvester suitable for both cereals and small seeds.

As farm size increases the capital invested per acre tends to fall. However, the investment per ewe equivalent remains steady at £12 for the three groups, owing to the corresponding fall in stock-carrying capacity as farms increase in size. The share of capital represented by land and buildings is similar for the groups, but livestock tends to demand a greater

South Otago downlands. In the left foreground and on the right is developed land in ryegrass-white clover pasture capable of carrying 3 ewes per acre. In the left background is an undeveloped area on which browntop is the predominant grass and there is scattered gorse.

TABLE 11—AVERAGE FARM CAPITAL STRUCTURE OF FARMS IN THREE FARM SIZE GROUPS

*Valuations	Group A (under 400 acres)		Group B (400 and under 700 acres)		Group C (over 700 acres)		All farms	
	Per acre £	Per cent. of total farm capital	Per acre £	Per cent. of total farm capital	Per acre £	Per cent. of total farm capital	Per acre £	Per cent. of total farm capital
Unimproved value of land	5.5		5.4		4.9		5.3	
Improvements on land ..	10.3		9.4		6.7		8.5	
Land and improvements	15.8	54	14.8	55	11.6	54	13.8	55
†Livestock	7.8	27	7.3	27	6.3	30	7.0	28
Plant and machinery ..	5.4	19	4.8	18	3.4	16	4.3	17
Total farm capital ..	29.0	100	26.9	100	21.3	100	25.1	100
Number of farms ..	29		44		23		96	

* The Government values for the land, buildings, and other improvements are 1952 valuations.

† The value of livestock is taken at conservative standard values for the various classes of stock.

share and plant and machinery a smaller share as the farms get larger.

Farm Income

The main feature of farm income (Table 13), is that 86 per cent. of the gross farm income on the downlands comes from sheep products, of which wool and fat lambs are the two chief items.

On some of the farms the sales of ewe hoggets and 2-tooth ewes are important revenue items. Included in the other sheep sold from these farms are cast-for-age ewes and rams, stud and flock rams, and fat wethers. Cash cropping on some farms is important, but over-all it forms only 9 per cent. of gross income, and on the larger farms pasture seeds, including browntop, bring in more than do wheat and oats. The more highly developed farms have an advantage in cropping over the less developed farms as a result of the improved fertility of the soil giving higher crop yields, which for wheat average 62 bushels per acre on the more highly developed farms compared with 49 on the less highly developed.

The income from cattle is small and on only 5 properties in 100 is it more than 10 per cent. of gross income. The value of the increase in stock numbers during the year is included as an item of income. The gross farm income per acre tends to fall as farm size increases. To produce £1 of gross farm income on the farms of Group A takes 14s. 10d. in farm expenditure, on farms of Group B 16s. 3d., and on farms of Group C 16s. 4d.; for all the farms in the survey it costs 16s. in farm expenditure to produce £1 of gross farm income.

TABLE 13—AVERAGE GROSS INCOME PER FARM FOR THREE SIZE GROUPS OF FARMS AND PERCENTAGE OF GROSS FARM INCOME RECEIVED FROM MAIN PRODUCTS

	Group A (under 400 acres)	Group B (400 and under 700 acres)	Group C (over 700 acres)	Total
Number of farms	29	44	23	96
Average size of farm (acres)	305	525	860	536
Gross farm income per acre (£)	9.9	9.2	7.0	8.5
Percentage of gross farm income from sheep products:				
Wool and skins	36	38	40	38
Fat lambs	30	31	22	28
Other sheep and lambs ..	21	18	21	20
Sub-total	87	87	83	86
Crops:				
Cereals	5	6	1	4
Pasture seeds	1	2	5	3
Other crops	1	1	5	2
Cattle	2	1	4	2
Other items	4	3	2	3
Total	100	100	100	100

TABLE 12—TRACTOR POWER ON FARMS DIVIDED INTO THREE FARM SIZE GROUPS

	Group A (under 400 acres)	Group B (400 and under 700 acres)	Group C (over 700 acres)	Totals
Number of farms with tractors	28	39	23	90
Number of farms without tractors	2	5	—	7
Total farms	30	44	23	97
Number of wheel tractors ..	26	52	23	101
Number of tracklaying tractors	7	12	13	32
Total tractors	33	64	36	133
Tractors with rated d.b.h.p.* of under 20	6	5	2	13
Tractors with rated d.b.h.p. of 20 and over	27	59	34	120

* The rated d.b.h.p. (drawbar horsepower) used here is 75 per cent. of the maximum d.b.h.p.

Farm Expenditure

Under farm expenditure are included all the routine farm-operating expenses, depreciation allowances on all buildings, plant, and machinery, and interest charges on the valuation of all assets. To make all farms, whether freehold or leasehold, comparable with one another interest charges at uniform rates on all farm assets are included and form the largest item (17 per cent.) of total expenditure (Table 14). Depreciation allowances are the second largest item (11 per cent.), followed by wages and contracting (10 per cent.).

High incomes in the year preceding the survey (1951) are reflected in high expenditure on items such as fertiliser, lime, and machinery. Farms on the downlands are in various stages of development from the initial stage with large areas in browntop to the final stage of well-developed farms. Where land development is being done some of the farm expenses should be regarded as capital expenditure, but owing to the difficulty of

South Otago is well known for the high quality of its Romney ewes, and the ewe fair at Clinton is one of the most important in South Otago and Southland.

separating them they are included in the farm expenses. Practically all items of expenditure show a tendency to increase with the size of the farm. Table 14 shows that farm expenditures per acre for Groups A and B are similar, but for Group C the figure is lower.

Owner Surplus

The surplus income that is left to the owner after all farm expenses and charges for depreciation and interest on assets have been deducted shows great variation from farm to farm.

The average figures of owner surplus for the three groups of farms are given in Table 15.

Owner surplus per farm tends to rise with farm size, but the surplus per acre and the surplus per £100 of total farm capital both tend to fall as farms increase in size.

The farms of Group A (under 400 acres) earn double the surplus per acre of the farms of Group C (over 700 acres). To produce £1 of owner surplus takes an expenditure of £2 18s. on farms of Group A, £4 5s. 10d. on farms of Group B, and £4 8s. 5d. on farms of Group C. For all the farms an expenditure of £4 is required to produce £1 of owner surplus. These figures emphasise the efficiency of the smaller farm units (Group A) at the present stage of farm development and under the present standards of farm management.

The 100 returns of income analysed range from a loss of £1300 on one farm to the highest owner surplus of £4900. The distribution of owner surpluses is shown in Table 16. Fifteen farms

TABLE 14—AVERAGE FARM EXPENDITURE PER ACRE FOR THREE SIZE GROUPS OF FARMS AND PERCENTAGES OF MAIN ITEMS

	Group A (under 400 acres)	Group B (400 and under 700 acres)	Group C (over 700 acres)	Total
Number of farms	29	44	23	96
Average size of farm (acres)	305	525	860	536
Expenditure per acre (£) ..	7.4	7.4	5.7	6.8
Percentage of total expenditure on:				
Wages and contracting ..	6	11	12	10
Repairs and maintenance ..	10	9	9	9
Flock, crop, and sundry expenses	5	5	6	5
Tractor, truck, and car ..	8	8	9	8
Lime	8	9	9	9
Fertiliser	9	8	9	8
Seed	5	4	5	5
Feed purchases	2	2	1	2
Cartage	4	3	3	3
Sheep purchases:				
Replacements	5	6	4	5
Stores for fattening ..	4	5	2	4
Cattle	1	1	2	2
Insurance and rates ..	2	2	2	2
Depreciation	13	11	10	11
Interest on value of assets	18	16	17	17
Total	100	100	100	100

TABLE 15—AVERAGE OWNER SURPLUS PER FARM FOR THREE SIZE GROUPS OF FARMS

	Group A (under 400 acres)	Group B (400 and under 700 acres)	Group C (over 700 acres)	Total
Owner surplus per farm (£)	777	924	1,153	917
Owner surplus per £100 of farm capital (£) ..	8.8	6.4	6.0	6.8
	s.	s.	s.	s.
Gross farm income per acre	198	183	140	169
Total expenditure per acre ..	147	149	114	135
Owner surplus per acre	51	34	26	34

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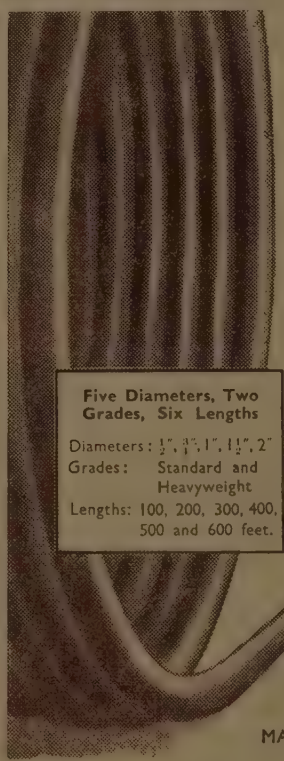

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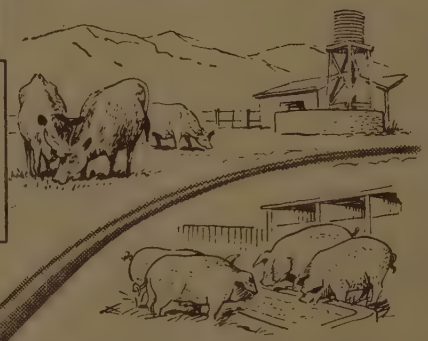

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failed to show an owner surplus and for 63 farms the surplus was below £1500.

TABLE 16—DISTRIBUTION OF OWNER SURPLUSES FOR 100 FARMS

Owner surplus	Number of farms
Loss:	
Over £500	4
Under £500	11
Surplus:	
Up to £500	27
£500 and under £1,000	20
£1,000 and under £1,500	16
£1,500 and under £2,000	8
£2,000 and under £2,500	7
£2,500 and under £3,000	2
Over £3,000	5
	100

Farmers are using part of this surplus to improve their farms to a higher productive capacity, which will tend to provide higher farm incomes in the future. With this development of its farms the downlands are destined to become a highly productive and prosperous region.

Farm Occupancy

Many of the farmers are returned servicemen from the Second World War and have been occupiers for only a short period. The time that present occupiers have had their farms is given in Table 17.

TABLE 17—NUMBER OF YEARS PRESENT OCCUPIERS HAVE OCCUPIED THEIR FARMS

Years in occupation	Number of occupiers
1 and under 10	58
10 and under 20	14
20 and under 30	16
Over 30	14
	102

More than half the farms have been occupied by present occupiers for 10 years or less, 32 of these for 5 years or less. This illustrates considerable turnover of land since the war.

Advances to Farmers

Advances to farmers are mainly in the form of mortgages secured on farm property, but advances have also been made for the purchase of livestock and plant and machinery. Of the 96 farms for which details are available, 25 farms are debt free; at the other end of the scale there are a few with total advances exceeding £10,000. The extent of indebtedness of farmers on the downlands is shown in Table 18.

TABLE 18—EXTENT OF LOANS MADE TO FARMERS

Amount of loans per farm	Number of farms
Nil	25
Under £2,000	24
£2,000 and under £4,000	19
£4,000 and under £6,000	18
Over £6,000	10
	96

Ploughing after turnips with a 3-furrow plough. Old browntop swards after being ploughed up are usually sown to swedes, after which another forage crop and a cereal crop may be grown before the area is sown to pasture.

The amount advanced to farmers averages £1306 for Group A, £3346 for Group B, and £2833 for Group C. As the years in farm ownership increase, advances tend to decline. Average debt drops from £5117 for those of under 5 years' tenure to £2984 for those of 5 to 9 years' occupation and it continues to fall steadily to £973 per farm for farmers with 30 years or more of occupation.

Comparison of High-earning Farms with Low-earning Farms

The comparison between two groups of farms with high average owner surplus and low average owner surplus respectively gives some indication of the relationship between farm management and financial returns. As the survey covered one financial year of farm operations, noting of gross farm income and farm expenses was considered necessary, because a high surplus may be the result of unusually low expenses for a particular year and a low surplus may arise from unusually high expenses in a year.

For those reasons the selection of the two groups was made after careful consideration of the farms, so that high owner surplus coincides with high production and low owner surplus with low production rather than these relationships being due to any financial irregularities.

Because of the small sample and the selective method of obtaining the sample definite conclusions cannot be drawn from the data, but they are considered to give an indication of factors which may contribute to high production and high owner surplus.

The average size of the 10 farms with the high owner surpluses was 575 acres, the group comprising 3 farms under 400 acres, 4 farms between 400 and 700 acres, and 3 farms over 700 acres. The average size of the 10 farms with the low owner surplus was 546 acres and there were the same number of farms in each size group.

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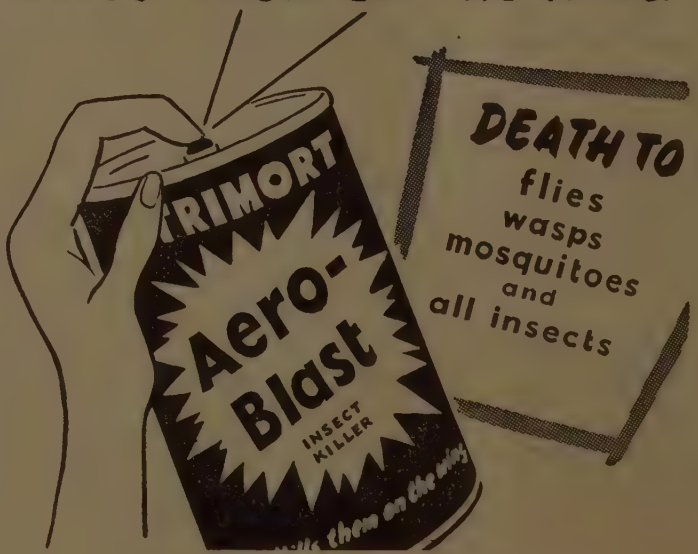

A crop of Cross 7 wheat on a paddock sloping down to the Clutha River. Cash crops occupy a small area on most farms on the South Otago downlands; the main cash crops are wheat and oats.

Farm Development

The amount of land that has been developed and sown to pasture is much greater in the high group (82 per cent.) than in the low group (53 per cent.). With more young pastures under 6 years old and treble the acreage of fattening feed, more winter feed, and more hay and small seeds the high-group land is more intensively used than the low-earning land.

Topdressing

The high-earning farms use 37 tons of fertiliser per farm, more than double the amount of fertiliser that is used on the low-earning farms (15 tons). On the former group 21 tons of fertiliser per farm are used in topdressing pastures compared with only 6 tons per farm in the low group. This difference in topdressing has significance in the maintenance and production of good pastures; in the high group 45 per cent. of the grazing is topdressed annually with fertiliser compared with 16 per cent. in the low group. In the high group the annual application of lime is 30 tons for every 100 acres of farm; in the low group it is 19 tons.

Stocking

On the high-earning farms the numbers of stock carried are approximately 70 per cent. greater per acre than on the low-earning farms. Stock-carrying capacity of the high group in winter is 2.5 ewe equivalents per acre of farm compared with 1.5 in the low group.

For every 100 breeding ewes on the high-earning farms 45 ewe hoggets are wintered compared with 32 ewe hoggets per 100 ewes on the low-earning farms. On the high-earning farms ewe hoggets not required as flock replacements are sold as hoggets or as 2-tooths. Sales of these ewes contribute 14 per cent. of the total farm receipts.

More attention is given to adjusting the size of flock to suit the feed situation on the high-producing farms than on the low-producing farms. Store lambs or wethers are bought in to use the surplus growth of rape crops and pastures, more ewe lambs are wintered, and cattle are bought and sold according to the feed situation.

Winter Feeding of Ewe Flocks

Swedes are the main feed from June or July until near lambing time. On the high-earning farms the feeding of hay may start a few weeks before the ewes are put on swedes; feeding of hay is then continued either on the swede breaks or on run-off pasture. Good pasture for this run-off is common on the high-producing farms; sometimes ewes are removed every night from the swedes to this pasture, or the gates may be left open for the ewes to pass through to it. A few hours on the break of swedes for a start and then feeding on pasture and hay is the general practice. About 10 to 14 days before lambing is due to start the ewes are taken off swedes and put on good pasture.

On the low-earning farms great reliance is placed on the swede crop, as hay is not commonly fed and a run-off to good pasture is not customary, though in a few instances an old run-out pasture or rough grazing in a gully is provided. On several of these farms the ewes are left on the swedes until the first lambs arrive before a shift to pasture or greenfeed is made.

TABLE 19—COMPARISON BETWEEN TWO GROUPS OF 10 FARMS EACH, ONE GROUP WITH HIGH OWNER SURPLUSES PER ACRE AND ONE GROUP WITH LOW OWNER SURPLUSES PER ACRE, SHOWING DIFFERENCES IN FARM DEVELOPMENT, TOPDRESSING, AND STOCK-CARRYING CAPACITY

Group	Average size of farm	Owner surplus per acre	Percentage of farmland developed	Percentage of farmland in grass under 6 years	Percentage of total grazing area topdressed		Winter carrying capacity per acre in ewe equivalents
					Lime	Fertiliser	
	acres	£ s. d.					
High owner surpluses	575	4 7 8	82	40	26	45	2.5
Low owner surpluses	546	4 10	53	27	10	16	1.5

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Management of Ewe Hoggets

On the high-earning farms ewe lambs are weaned on to good, clean pasture such as hay aftermath. A start is made with feeding a little hay before the lambs are put on clean breaks of swedes in April or May ahead of the ewes. Good hay and chaff are often given on the swede break and a run-off to pasture is frequently provided. On some farms hoggets are taken off swedes every 3 or 4 days to have a bite of pasture. Chou moellier may be grown or included with the swedes where no run-off is provided. In late August or September the hoggets go on to good pasture, which may be the new grass of the previous season.

On the low-earning farms the hoggets get less attention, though grazing on autumn-saved pastures gives them a good start. Generally they are late in starting their winter feeding; a few farmers begin feeding at the end of April, but some wait until June and July before putting hoggets on swedes. On less than half of the low-earning farms hay or chaff is provided and seldom is a bite of pasture given. This treatment may account for the heavier losses on these farms, where the death-rate in hoggets is 5 per cent. compared with under 3 per cent. on the high-earning farms.

Vaccination for pulpy kidney and blackleg is more common on the high-earning farms than on the low-earning farms. The same is true of drenching lambs to reduce worm infestation, which is commonly done on the better farms at weaning and again before the lambs go on to turnips.

Production

The lambing percentage is higher on the high-earning farms (104 per cent. against 91 per cent. on the lower-earning farms). The deliberate flushing of ewes on fresh pasture or green-feed before mating in autumn is practised on 8 of the 10 high-earning farms and on 4 of the low-earning farms. In the production of lamb meat and wool the high farms are well in the lead, as these items are the two main sources of their high income. The high-earning group produced an average of 39.5lb. of lamb meat and 27.1lb. of wool per acre; the low-earning group produced 15.8lb. of lamb meat and 12lb. of wool per acre.

Farm Machinery

The importance of having adequate farm machinery on these downlands farms may be gauged from the fact that the high-earning farms have double the tractor horsepower per farm of the low-earning farms. There are two tractors per farm in the high group as against 1 per farm in the low group; the rated drawbar horsepower averages 26 h.p. per man in the former group and 15 h.p. per man in the latter group.

With more tractor and truck power available the high-producing farms adhere to their farm programmes much better than do the low-producing farms.

The high-output farms have more implements to assist them, particularly cultivators, power mowers, trailers, grain drills, shearing stands, concrete mixers, bag elevators, and post-hole diggers. With these aids they are able to get work done at the right time, their cultivations are thorough, and the crops are sown at the best time. The difference in the average total farm capital per acre of £30 9s. for the high-earning group and £17 per acre for the low-earning group is represented in more power machines and farm implements, more buildings, fencing, sown pastures, and livestock on the high-earning farms.

Economic Results

The remarkable difference in the gross income per acre is mainly due to greater sheep production on the high-earning farms. Sheep products contribute 92 per cent. of the total money receipts in the high group and 85 per cent. in the low group; cash crops, mainly wheat and pasture seeds, yield 6 per cent. and 5 per cent.

TABLE 20—DIFFERENCES IN AVERAGE GROSS FARM INCOME, AVERAGE TOTAL FARM EXPENSES, AND AVERAGE OWNER SURPLUS ON TWO GROUPS OF 10 FARMS EACH, ONE WITH HIGH OWNER SURPLUSES PER ACRE AND ONE WITH LOW

Group	Average size of farms acres	Owner surplus per acre £ s. d.	Average gross farm income £	Average farm expenses £	Average owner surplus £
High owner surpluses	575	4 7 8	7,285	4,764	2,521
Low owner surpluses ..	546	4 10	2,459	2,327	132

The South Otago freezing works at Finegand, near Balclutha. A recent addition to the buildings to increase killing space has been necessary partly owing to the development of the South Otago downlands as a fat lamb producing area.

respectively. The average income, expenditure, and surplus for the two groups are shown in Table 20.

To earn £1 of gross income costs the high producer 13s. 1d. and the low producer 18s. 11d. in farm expenditure.

In the earning of this reward the high group have a greater total expenditure. The main difference lies in wages, which in the high group are more than double those in the low group; lime, fertiliser, seed, sheep, and lamb purchases are greater; and depreciation and interest charges are more than double. The only item in which the low group exceeds the high group is in the cost of fodder purchased. For high production on the downs farm expenditure is high, but the resulting output gives a satisfactory surplus.

In the high group a gross expenditure of only £1 17s. 9d. was incurred to obtain an owner surplus of £1, whereas in the low group £17 12s. 7d. gross expenditure had to be incurred to obtain an owner surplus of £1. The many factors of high production farming that have been mentioned in this survey have probably contributed to the success of these leading producers, though definite conclusion cannot be drawn from the comparisons that have been made between the two groups.

Conclusions

Spectacular progress has been made in farm production on the South Otago downlands during the past 20 years with the adoption of scientific methods of farming. The standard of living, which was not high in the past, is now rapidly improving as farmers are able to expedite development work as a result of the buoyant market for sheep products. The replacement of old browntop swards with good pastures has changed an area that was once almost marginal country into a highly productive state.

High farm production is mainly a matter of improving the stock-carrying capacity of the land by good young pastures. On many farms drainage, lime, and fertiliser are prior requirements for the establishment of good pastures, which, regularly topdressed and supplemented by good feed crops, allow stock numbers to be safely increased. Good winter feeding of ewes and hoggets is necessary for high production. For wool improvement in the ewe flock, rams should be chosen carefully for mating with selected ewes. Fat lambs are next in importance to wool as a source of income and a good standard of both products can be achieved. Good yields from cereal crops are obtained from the increasing soil fertility of improved farms.

Farming Potential

An estimate of the potential farm production of the downlands of Clutha County can be based on the present production of the top 10 per cent. of farms earning the highest owner surpluses. These top farms are not at peak production by any means, so the increases given here are conservative figures which should be readily obtained in the future. Approximately 240,000 acres are occupied on the downs. If all farms were raised to the present standard of the top 10 per cent., the number of breeding ewes would increase by 81,000 or 23 per cent. A great increase in wool production (about 6500 bales) would come partly from a 12 per cent. increase in the over-all yield of wool per sheep and partly from a 21 per cent. increase in livestock carried. Lamb meat production would increase by approximately 10,000cwt. or 13 per cent. from proportion of the 86,000 more lambs tailed.

A good deal of land improvement is required over a period of years to achieve this standard of production. There are approximately 32,000 acres of ploughable land now in poor grazing which should be reploughed and resown to pasture. In addition to this many run-out pastures need renewal. A further 1300 acres of turnips and swedes would be needed to feed the increased stock and additional fencing would be required for subdivision. The amount of fertiliser used annually would increase by 40 per cent. or 4000 tons and lime by 6 per cent. or 4000 tons. More farm labour would have to be available and, depending on the rate of development, suitable accommodation would have to be provided. More men for shearing and fencing would be wanted; ancillary industries, including cartage and agricultural contractors, would require more labour and machines.

£1,000,000 Increase in Capital

This improvement would require an increase of about 23 per cent. in total farm capital or over £1 million. Given sufficient time some farmers would finance their own development from their savings, but additional capital would have to be provided for others. The estimated potential production would raise present gross income by 49 per cent. and farm expenditure by 23 per cent. In this way owner surpluses would rise by 148 per cent. to well over double the present total of nearly £500,000. To reach the estimate is not an impossible task; the top 10 per cent. of farmers are now surpassing the required standard as their farms are steadily improving.

Acknowledgment

The assistance given by farmers, accountants, and the staffs of the stock and station agencies and freezing works is acknowledged.

Leptospirosis in Dairy Cattle

By D. C. DODD,
Veterinary Diagnostic Officer, Department of Agriculture Animal Research Station, Ruakura

(Adapted from a paper at the Ruakura Farmers' Conference 1955)

A FEW years ago leptospirosis had not been heard of in dairy cattle, but today it is a disease well known, at least by name, to all dairy farmers and to anyone connected with the dairy industry. For 30 years or more a condition called redwater had been recognised in calves, but no one knew the cause. All sorts of treatments were recommended. Of these common salt and bicarbonate of soda were the most popular. Sometimes they seemed to effect a cure. But now it is known that many animals affected with redwater will recover in any case, so the claims for the salt treatment were probably not very sound. Today leptospirosis or redwater, as it is popularly known, is an almost "fashionable" disease in dairy animals. The disease also occurs in sheep, in pigs (the natural carriers), in dogs, in horses occasionally, and also in man.

THE term redwater is not a very suitable one, for the passage of red urine is by no means a constant feature and there are several other diseases in which the urine also becomes red. Leptospirosis and redwater are therefore not synonymous. Leptospirosis causes heavy losses every year in New Zealand and has become of major economic importance. A similar situation exists in Australia and the U.S.A. The fact that man, too, is commonly infected makes it all the more important.

In the few years since leptospirosis was first recognised a great deal of knowledge about it has been gained both by research and the study of natural outbreaks. New facts are coming to light almost daily, but there are still many gaps in knowledge of the disease.

Cause

Leptospirosis is caused by an organism called *Leptospira pomona*, which was first identified in Queensland, Australia. It belongs to a rather special class of organisms which lead a parasitic existence; that is to say, it can live for only a short period outside the animal body. To maintain its existence it has adapted itself to one species of animal, with which it lives in a state of harmony. It does not do that animal any harm, but at the same time the animal is unable to rid itself of it.

The pig is believed to be the natural carrier of the organism causing leptospirosis and so is able to perpetuate the disease by spreading the infection to other farm stock. Though harmless to the pig, the organism causes in other animals a severe body reaction which is often fatal. The leptospiral organism is also unusual in that special techniques are required both to see it and to grow it artificially in the laboratory.

Mode of Transmission

Though the pig is the main reservoir of infection, some cattle may also be carriers. These may suffer only a mild reaction, which is often unnoticed, but will continue to pass the organism out in the urine for some weeks or months—for just how long is not known—and can be a means of causing sudden, unexplained outbreaks in calves.

The disease is spread to man by infected milk, infected urine, and through handling the carcass of an animal that has died in the acute stages of the infection. There is no evidence that infection is transmitted to cows at service.

Symptoms in Calves

Calves are much more susceptible to infection than are adult animals, so most of them become affected with the acute form of the disease and show marked clinical signs. Among affected calves that are not treated the death-rate is high, even up to 100 per cent. when the strain of the organism is particularly virulent.

After contraction of the infection a certain time elapses before outward signs of illness are apparent. This is known as the incubation period. During this time, which may vary from a few to several days, the organism establishes itself in the body, multiplies, and reaches sufficient numbers to produce the actual disease. As with almost any infection a rising temperature, loss of appetite, and general dullness are the earliest signs of impending illness. Even at this stage the disease may progress no further and the animal may recover and become a carrier, temporarily at least. Normally such a transient and mild illness passes unnoticed.

However, if the organism gains the upper hand, the calf becomes seriously ill, begins to pass red urine, may develop jaundice, and dies suddenly. This is the most common course in calves. When the urine becomes red the calf is at the most critical stage and its chances of recovery are not very good, but it still may recover without treatment, though it is not wise to tempt providence by withholding it.

Symptoms in Adult Cows

Leptospirosis in adult cattle is much more likely to be a passing infection where the symptoms are so mild that they escape notice. Few ever die from the disease. Even those which do develop red urine usually suffer only a mild disturbance. They are off colour for a day or two and there may be a drop in milk yield and temporary loss of appetite. The urine soon loses the red colour and the cow suffers no apparent after-effects, but without treatment she is still excreting leptospiral organisms in the urine and this is a danger to calves.

At one time it was thought that that was all there was to be said about leptospirosis in the adult cow, but now it is known there is much more to it. Leptospirosis has been added to the list as one of the specific causes of abortion.

There have been herds in which there has been a virtual abortion storm caused by leptospiral infection. At present insufficient information is available to show how many abortions in New Zealand are caused by this infection. Over-all it is probably not a serious problem. Present indications are that this type or abortion occurs in the later months of pregnancy; actually true abortion, that is, expulsion of the calf, does not always take place; sometimes the calf dies, but remains in the uterus and will become mummified. The calves may be born alive, but be infected.

Diagnosis of leptospiral abortion is not as easy as with contagious abortion. The organism can be identified from specially prepared stained sections of affected tissues, but this is a relatively slow process. It may be seen in the urine, though this also is difficult. There is a blood test, too, and though it is reliable, the interpretation of it in terms of abortion is not plain sailing. The only conclusion that can be drawn from a positive blood test is that the animal has been infected at some time with leptospirosis. However, if there is no evidence of any of the other infective causes of abortion, leptospiral infection can be strongly suspected as the cause.

Post-mortem Findings

For the sake of their own health farmers should not undertake the examination or even the skinning of a calf that has died of leptospirosis. Infection can mean a serious illness and several weeks in hospital.

To the untrained observer such an examination is not worth while. There is little to see apart from jaundice and red urine in the bladder. In less acute cases small white spots may also be seen on the surface of the kidney.

LEPTOSPIROSIS . . .

Treatment and Control

The modern antibiotic drugs penicillin, streptomycin, and aureomycin are all effective against the leptospiral organism if given early. It is no use calling in the veterinary surgeon when a calf has had redwater for a few days and is on the down-grade except, of course, as a protection against other stock. Though these drugs have been called miracle drugs, they have to be administered within a reasonable time to effect a cure.

However, to cure the animal is not enough; the organisms must also be completely eliminated. The animal must not be excreting organisms in the urine and infecting other stock. Adequate dosage of the appropriate drugs under veterinary supervision over a period normally meets both requirements.

Control of Leptospirosis

The ideal method of control of any disease is, of course, prevention. A lot can be done to control and even prevent disease outbreaks by segregation of infected animals and strict hygienic measures. But even in the best-managed farms and in the healthiest of animals infective diseases do occur. How can this be prevented?

Vaccination is often the answer, but every disease cannot be handled this way. A vaccine is not always an easy thing to produce and this has been found to be true with leptospirosis. Research into the development of a leptospiral vaccine is going on in New Zealand and other countries, but to date no one has succeeded in producing an effective vaccine, though there are hopes that sooner or later this means of controlling leptospirosis will be available. Other control measures are based on:—

1. Sound management to prevent the introduction of diseased stock and the contact of dairy stock with pigs.

2. Early diagnosis and segregation of sick animals.

Summary

The present position may be summarised thus:—

1. Leptospirosis is an infectious disease of dairy cattle; it affects both young and mature beasts. In the young it is often fatal and can cause a high mortality rate in a calf herd if not checked. Adult cattle often have the disease in a form which is very mild. Abortion can occur in pregnant animals owing to infection and death of the developing calf.
2. Recovered animals unless treated may be carriers of the organism.
3. Early treatment and diagnosis are essential to control an outbreak.
4. Dairy stock should not be run in contact with pigs, which are the natural carriers of leptospirosis.
5. Leptospirosis can be transmitted to man from infected animals.
6. Professional advice should be sought as soon as the first animal shows signs of leptospirosis; these signs are redwater and jaundice.
7. An effective vaccine is not yet available.
8. Leptospirosis must not be treated lightly. In a few years it has developed from being an unrecognised disease to one of major economic importance.

Radio Broadcasts to Farmers

RADIO broadcasts to farmers will be given during March as follows:—

1YZ Rotorua, 7.15 p.m.

1 March—"Stoopless Milking", by L. E. Downs, Special Inspector, Department of Agriculture, Hamilton.

15 March—Autumn Pasture Management", by B. A. Gunning, Instructor in Agriculture, Department of Agriculture, Matamata.

29 March—"Wax Moth and Its Control", by the Apiary Instructor, Department of Agriculture, Tauranga.

1XH Hamilton, 12.33 p.m.

12 March—"Causes of Abortion in Cattle", by O. V. Griffiths, Veterinarian, Department of Agriculture, Hamilton.

19 March—"Insect Pests in the Garden", by W. Brandenburg, Horticultural Instructor, Department of Agriculture, Hamilton.

26 March—"Pig Progress", by D. J. Carter, Federated Farmers, Hamilton.

Regular Sessions

1XH Hamilton, Mondays at 12.33 p.m. and Tuesdays at 8 p.m. (Frankton stock market report), Wednesdays at 12.33 p.m. (report from Ruakura Animal Research Station), Thursdays at 12.33 p.m., Fridays at 8 p.m. (stock sale review).

1XN Whangarei, Mondays at 8.5 p.m., Wednesdays at 8.1 p.m. (Northland stock market report), Fridays at 8.1 p.m.

1YZ Rotorua, Mondays at 12.33 p.m. (Waikato stock market review), Tuesdays at 7 p.m. (Hamilton stock market report), Wednesdays at 7.15 p.m. (Pig Council talk on fourth Wednesday of every other month), Thursdays at 12.33 p.m. and 7.15 p.m. (fortnightly).

2XA Wanganui, Wednesdays at 8 p.m. (Wanganui stock sale report), Thursdays at 8 p.m.

2XG Gisborne, Tuesdays at 8 p.m., Fridays at 8.2 p.m. (Gisborne stock market report).

2XN Nelson, Thursdays at 8 p.m.

2XP New Plymouth, Thursdays at 8.1 p.m.

2YA Wellington, Mondays at 7.15 p.m., Thursdays at 12.33 p.m., Fridays at 7 p.m. (Feilding stock market report).

2YZ Napier, Tuesdays at 12.12 p.m. (Hawke's Bay orchardist session), Tuesdays at 7.10 p.m., Wednesdays at 7.15 p.m. (Hawke's Bay-Poverty Bay livestock market report), Thursdays at 12.33 p.m.

2ZA Palmerston North, Mondays at 12.33 p.m., Fridays at 8.45 p.m. (Feilding stock market report).

3XC Timaru, Mondays at 8 p.m. (Pleasant Point stock market report), Tuesdays (fortnightly) at 8 p.m. (Temuka stock market report), Wednesdays at 8 p.m., and Saturdays at 10.30 a.m.

3YA Christchurch, Mondays at 12.20 p.m., Wednesdays at 7.15 p.m. (Addington stock market report), Thursdays at 12.33 p.m. and 7.15 p.m.

3YZ Greymouth, Mondays and Thursdays at 12.33 p.m.

4YA Dunedin, Mondays at 12.33 p.m., Wednesdays at 7 p.m. (Burnside stock market report), Thursdays at 12.33 p.m.

4YZ Invercargill, Mondays at 12.33 p.m., Tuesdays at 7 p.m.

Inspection Service is Important Section of Meat Industry

NEW ZEALAND is the world's largest exporter of frozen and chilled meat and the annual value of this produce is now about £50,000,000. As none of this produce is accepted by importing countries unless it is passed by a properly organised system of meat inspection, the importance of the meat inspection service, which extends also to meat for local consumption, becomes clear.

About 300 meat inspectors are employed by the Animal Industry Division of the Department of Agriculture and each year some vacancies in this service occur. Applicants for them must be between 20 and 30 years of age, of good address, and have had some secondary school education. Previous experience in the meat trade or freezing works is not essential.

The meat inspection staff of the Animal Industry Division administer the Meat Act 1939 at the freezing works or abattoirs at which they are stationed and carry out the grading of meat for local consumption. Inspectors also assist local field officers with extension work.

Applicants are accepted as Assistant Meat Inspectors and are required to take an examination after the completion of a training period which must cover two killing seasons. Those who pass the examination become Meat Inspectors.

Duties

Duties include supervision of the cleanliness of all premises and equipment associated with meat processing in all its aspects; examination of animals before slaughter to see that they are in good health and of all meat and offals to ensure that they are free from disease; and the grading of all meat killed at meat works or abattoirs for consumption in New Zealand.

Information about vacancies in the meat inspection staff of the Department may be obtained from the nearest office of the Department of Agriculture or from the Staff Training Officer, P.O. Box 2298, Wellington.

Prevention and Control of Robbing by Bees

Seasonal Notes for the Domestic Beekeeper

THOUGH the highly complex organisation of the honey bee colony demands the complete subordination of the individual to the general welfare, the colony as a unit has no regard for other colonies and, given the opportunity, will at times attack them, robbing out their honey and leaving them to die of starvation. In this article D. Roberts, Apiary Instructor, Department of Agriculture, Auckland, discusses the causes of robbing and suggests means for its prevention and control.

AS with that of most other groups of social insects the truly remarkable organisation of the honey bee colony, with its specialised division of labour and foresight in the accumulation and storing of food sufficient to tide it over seasonal periods of dearth, is designed only for the preservation of the individual colony. Each colony displays a total disregard for the welfare of others, though all may have recently derived from the same parent stock. The instinct to gather nectar and other sweet foods is inherent in all honey bees of the worker caste. This instinct is the dominating factor in their behaviour and when natural sources of food are not available worker bees do not scruple to attack other colonies in an endeavour to seize their stores.

[*Elmwood*

Hive entrance with sheet of glass in front to discourage and confuse robbers.

[*Elmwood*

Hive entrance with reducing block in place.

Whenever weather permits bees fly out from their colonies seeking food. As long as supplies of nectar are available they confine their attention to this natural source. When through seasonal or sudden weather changes the supply of nectar greatly diminishes or is cut off they will turn their attention to syrups, sugar, fruit juices, or any other sweet material that is readily accessible. At such times, too, they may be attracted to other colonies and attack them, particularly those that are weak in bees or whose hives are so poorly constructed that robbers can gain access at several points.

This tendency to rob is usual during periods when normal colonies are at good strength and there is a dearth of nectar. These conditions may occur in late spring and early summer, when sudden deterioration in the weather often occurs, and they are always present at the termination of the main honey flow.

At these times robbing can be easily initiated through the careless manipulation of hives, the exposure of honey where bees may easily reach it, or the feeding of colonies with sugar syrup or honey without the exercise of proper care. An outbreak of robbing can develop and reach serious proportions in a few minutes. If an outbreak is not promptly controlled, it may quickly reach a stage where the bees of an apiary become demoralised and the apiary is destroyed.

Causes of Robbing

Vigorous, healthy colonies housed in properly constructed hives will repel any attempts at robbing, but nucleus colonies or those weakened by disease, lack of a queen, or shortage of stores readily fall victims to the onslaughts of robbers. Once robbers have met with success in their forays they will continue to attack hive after hive until the whole apiary is in an uproar.

Careless hive manipulation and accompanying exposure and spilling of honey are the most common causes of robbing being started. Small nucleus hives established with or near strong colonies are sometimes attacked, particularly when provided with entrances that are too large or when housed in faulty equipment. Colonies that are queenless or weakened by disease seem to have but little incentive to protect themselves and quickly succumb to attack.

The exposure of honey during extracting or the leaving of cappings and scraps of honey in the open where bees can reach them will often serve to start robbing. Beginners and beekeepers with little experience finding that bees during a honey flow are gentle and quiet and display no interest in exposed honey may fail to realise that in other circumstances the same bees can quickly become a horde bent entirely on theft from adjoining colonies.

Prevention of Robbing

However, robbing need not be a menace if the beekeeper displays proper appreciation of the risk and takes sufficient care at all times when it is likely to occur. If manipulation of colonies becomes necessary during these times, the hives should be

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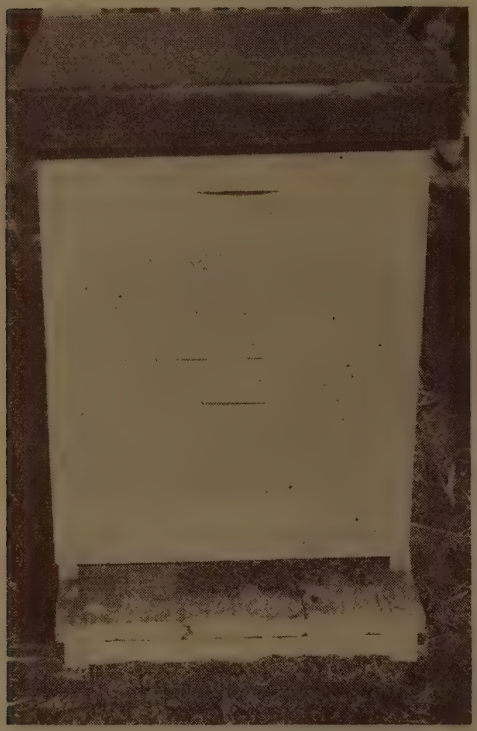
opened carefully and any necessary work done as speedily as possible. Though speed is essential, disturbance of the colony must be kept to a minimum and particular care taken to see that honey and wax are not spilt on or outside the hive. Combs lifted out for examination should not be left exposed, but should be replaced in the hive immediately scrutiny is completed.

If the crop has to be removed from a hive when robbing is prevalent, the combs should be covered immediately they are lifted off. Supers of honey when removed from the hive should be stood on a piece of clean sacking or in a spare hive lid inverted. This will ensure that honey does not drip on the ground round the hives. Should the bees show evidence of undue disturbance after examination or crop removal, the hive entrances should be reduced by a block of wood or similar means to a space of not more than 6in. x ⅜in. At the same time hive bodies, lids, and floors should be checked over and any cracks or crevices which would allow the entry of bees should be blocked.

Bees determined to rob will force themselves through very narrow openings. Lids which do not fit closely or supers which do not rest evenly on one another may allow cracks which normally the bees would not use. Persistent robbers, however, will force entry through such openings, particularly when the main entrance is well guarded. Any building used for extraction or storage of honey must be absolutely beetight and kept so until robbing has subsided.

The practice indulged in by some beekeepers of placing cappings from extracting combs and scraps of waste

Feeding bees. Above—A 5lb. honey tin used as a feeder. The entrance is blocked. Below—Division board feeder being filled with sugar syrup.



A well-constructed, good-fitting hive.

honey in the open for the bees to clean up cannot be too strongly condemned.

Besides the danger of inciting robbing, this practice can conceivably be responsible for the dissemination of brood disease. If the honey is to be fed back to the bees, it should always be given inside the hive through the use of one of the standard methods. Where colonies require feeding during periods when robbing is likely the bees should not be fed until dusk and no more should be given at one time than the colony can store in the combs in the one night. Indiscriminate feeding of honey or sugar syrups, which is common among inexperienced beekeepers, is a prime cause of robbing and may cause it to develop even when other conditions are not in its favour.

Control of Robbing

Beginners are likely to experience considerable difficulty in recognising the initial stages of robbing. To the inexperienced the play or orientation flights of young bees may convey the impression that robbing is in progress. These flights, however, occur only when brood rearing is in progress and generally take place in warm and sunny periods about midday. There is no disturbance or fighting and the bees quickly return to the hive. When a colony has been confined to the hive by bad weather for 2 or 3 days the bees will issue for a cleansing flight on the first warm break and this again could give the impression that robbing was in progress.

When robbing is under way the robbers will be found to fly back and forth across the entrance of the hive in a furtive manner and groups of bees can be seen struggling on the alighting board. Dead and dying bees will be found in front of the entrance and other bees will be seen flying about the hive seeking entrance at all possible points. Unless robbing is well advanced robber bees do not approach the hive entrance boldly. They hover back and forth and when they alight they do not proceed directly to enter the hive, but act in a nervous, guilty manner and when challenged by a guard bee retreat and try again to elude the guards. It is usually difficult to distinguish robbers by physical appearance, though persistent robbers will eventually become smooth, shiny, and very dark.

Identifying Robbers

When robbing begins in an apiary of more than two or three hives it is not always easy to determine which colony is the aggressor. In such a case the bees seen to be emerging from the robbed colony should be sprinkled with flour, when the robbers can be quickly recognised as they return to their own colony.

If robbing has only just started, it can sometimes be simply controlled by reducing the entrance of the colony attacked to a space sufficient to allow entry of only one or two bees at a time and by ensuring that the hive is beetight elsewhere. In addition a repellant such as benzine, diesel fuel, or one of the coal tar derivatives painted round cracks and on the front of the hive a few inches above the entrance will assist. If this fails, a sheet of glass laid across the front of the hive to form a tunnel over the entrance will sometimes help.

If all these manipulations prove ineffective and the robbers are known to be coming from a colony in the same apiary, the following method will often give excellent results. The colony being attacked is moved to the site occupied by the robbers and the robbing colony placed on the site previously occupied by the attacked colony. Should the robbers be coming from a neighbouring apiary or a wild hive, the robbed colony is closed by putting gauze over the entrance and is placed in a cool, shady place. A strong, vigorous colony is put in its place with its entrance reduced to about half the normal width. The robbers attacking the new hive will get such a warm reception that they quickly become discouraged.

Destroying Robbers

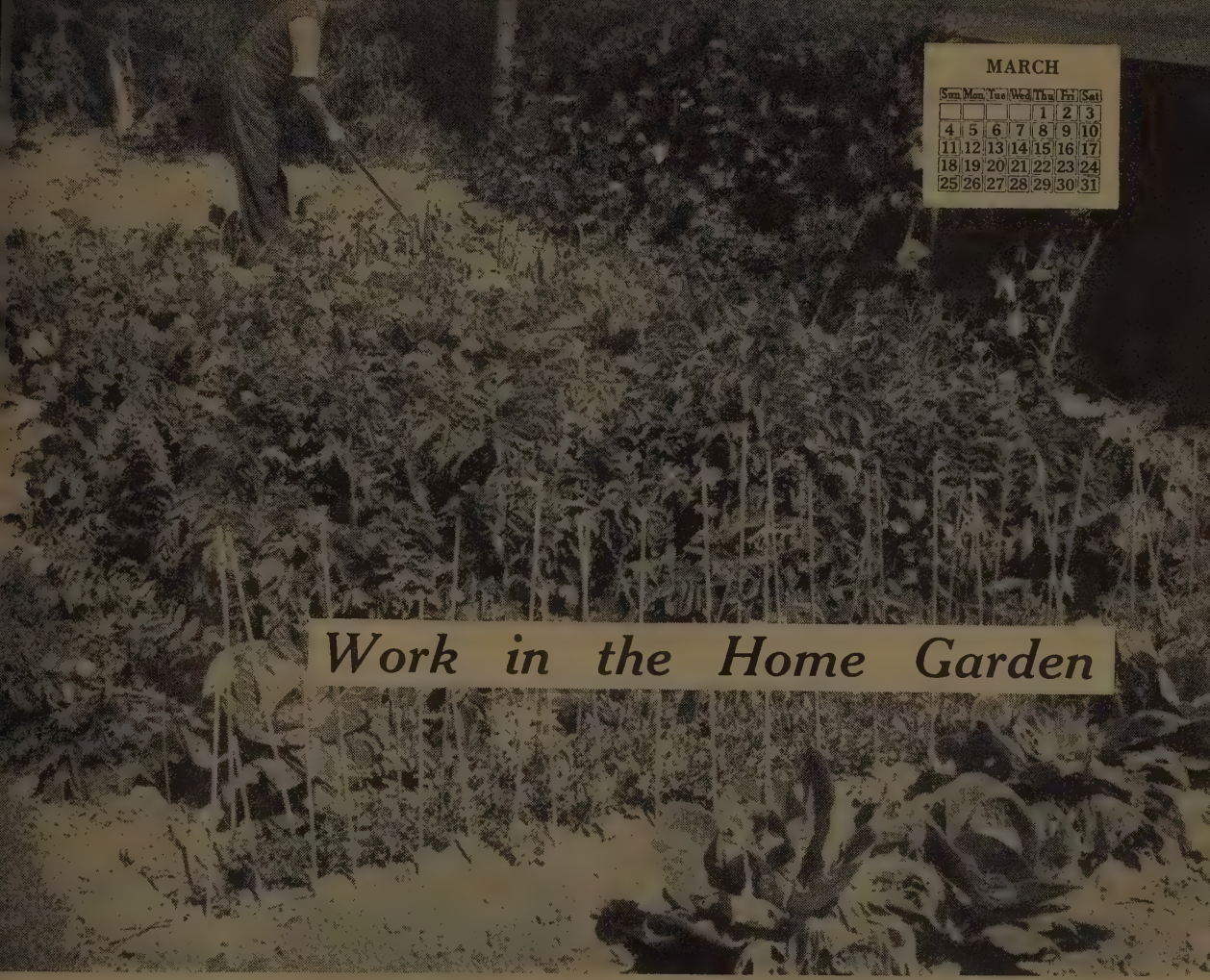
Where no strong colony is available for substitution, an empty hive can be placed on the site and two or three combs of honey placed inside. The robber bees finding no further resistance will quickly congregate in this hive, where they can be destroyed by applications of a good insecticide. If the last course is adopted, the beekeeper will have to be present for an hour or two so that continued applications of insecticide may be given as required. Unless several hives are involved in the robbing, this technique will prove extremely effective, provided it is applied at a period of the day when bee flight is greatest.

Robbing between the hives of a single apiary can generally be controlled by the methods first described, but where the bees of a neighbouring apiary are responsible, robbing is likely to get entirely out of hand unless checked quickly in the early stages. Because robbing can have serious consequences, with extensive loss of colonies and stores, it should be guarded against at all times. It will not normally occur, however, if due attention is given to the provision of properly made, well-fitting hive equipment and the exercise of sound management practices.

Book Review

"THE Storage of Apples and Pears": C. A. S. Padfield. In bringing together in one publication information on storage problems which has accumulated in New Zealand over the past 30 years the author has rendered a valuable service, and this bulletin is recommended to all who are engaged in the growing or storage of pip fruits.

New Zealand Department of Scientific and Industrial Research Bulletin No. 111. 8s. 6d.



Work in the Home Garden

THE enthusiasm for gardening of all but the keenest home gardeners has usually waned considerably by March, because by then most good-sized, well-organised gardens are well supplied with vegetables. Toward the end of the month the noticeable shortening of the days and usually cooler evenings signify that the main growing season is nearing its end. Most of the main-crop vegetables are mature or getting past their best, but weeds that have not been dealt with are growing vigorously. The growing season is not yet finished and apart from harvesting, garden work, as in February, consists largely of attending to the sowing, planting, and cultivation of crops to mature during the forthcoming months before growth slows in winter. In this article A. G. Kennelly, Horticultural Instructor, Department of Agriculture, Dunedin, discusses work in the vegetable garden in March.

WORK in the home garden in March is largely a continuation of that done in February. It includes weed control, the sowing or planting of crops to mature before winter or to become established to the stage where full, rapid development can take place in early spring, composting, watering where necessary, and digging over and sowing vacant land with green crops.

Shallots and onions can be harvested in March and stored in a dry, airy place. The pods of beans and peas should be gathered before they are fully mature so that the growth of the plants will not be checked. Vegetables such as cauliflower, broccoli, leeks, savoy cabbage, and silver beet intended for winter and spring use should be kept cultivated and, where necessary, fed with liquid manure to ensure that good growth is maintained.

Main-crop potatoes can be harvested when they are mature. Earlier sown crops such as lettuce, spinach, and silver beet can be thinned or seedlings can be planted out. The spraying of brassicas and celery, and in most northern districts of potatoes and tomatoes, should not be overlooked. The compost heap should be built up and rubbish infested with active insect pests or bearing the spores of long-lived or highly resistant diseases should be burnt.

Carrots

Carrots are one of the most important and popular vegetables because of their nutritional value, flavour, and long period of availability, but many home gardeners have difficulty in growing satisfactory crops from late spring and summer sowings. Apart from the need for a well-cultivated, highly fertile soil, one reason for lack of success is that seed does not germinate, nor do young seedlings grow well when soil conditions are very hot and dry. The roots of established plants stand fairly high temperatures, possibly in part because they are in the relatively cooler undersoil, but growth is usually better when temperatures are not too high.

In districts where winter temperatures are not too low home gardeners desiring early spring carrots should make a sowing about the end of

Heading photograph by Green and Hahn.

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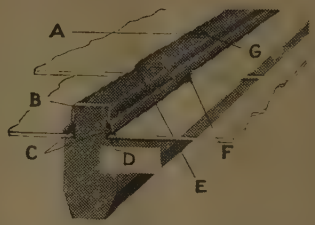

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March. Where drainage is poor a raised bed is advisable and for convenience in cultivating and harvesting the bed should not be more than 3ft. wide. Soil heavily manured for the previous crop is best and sandy or light loams are especially suitable for autumn crops.

Soil Conditions

Soil should be of good texture and should not bake or form a crust after rain, or emergence and growth may be adversely affected. Heavy soils on which growth is comparatively slow tend to produce thick, short carrots with greater core development and inferior table quality than do lighter, more free-working soils. Trials with some popular varieties, Chantenay for instance, have shown that roots which are accepted as most typical of the variety are produced when the temperature during growth is about 65 degrees F. At 10 degrees lower they are longer and thinner and at 10 degrees higher they are shorter and thicker.

Carrots vary in shape, colour, and size according to variety, but all these characteristics may be influenced by soil conditions. Soil influences size more than it does shape. Colour, too, varies considerably. The colour most desired by the housewife is usually red or orange-red and is a result of an accumulation of a substance called carotene.

Because carotene is laid down first in the oldest cells and a carrot grows from the cambium or soft, single-celled, formative layer between the internal xylem or wood and from the phloem or bast, colour gradients, which radiate from the centre out and the skin or outer surface inward, can be seen readily if a root is cut vertically. Carotene content is a varietal characteristic which is, however, influenced by temperature and availability of plant food.

Irregular moisture supply and high temperatures bring about the development of a rough surface on the carrot. Horizontal depressions which may be quite deep occur on the root and make it wasteful in preparation for the table.

Sowing

Carrot seed should be sown thinly, ¼in. to ⅜in. deep, according to whether the soil is heavy or light, in rows about 12in. apart. If the soil is light and free, there should be no need to thin, but on heavier soils young plants can be thinned to about 2in. apart. Thinning should be done preferably when the soil is moist so that the remaining seedlings are disturbed as little as possible. If thinning is delayed, the thinnings can be used for soups and stews. One quarter of an ounce of seed should sow about 100ft. of row.

Carrot seedlings are delicate and cannot compete with weeds or withstand drying out which may be the result of baking or cracking of the soil. Cultivation should therefore begin as soon as the rows can be distinguished. A little radish seed, which germinates quickly, is sometimes sown with some of the carrot seed to give an early indication of the position of the carrot rows.

Good varieties include Chantenay, Taranaki Strong Top, Nantes, and Morse Bunching. Scarlet Horn is widely used where a quick-maturing carrot is wanted.

[*Green and Hahn*

Self-blanching celery can be blanched readily by being covered with boards on either side of the row.

Celery

Early celery should now be ready for harvesting. As some of the quick-maturing varieties that are usually grown for early use tend to become overripe and pithy and lose weight and flavour if held too long, the plants should be watched for signs of near or full maturity and harvested and used then.

Celery is usually harvested by removing the blanching paper or boards and then driving a sharp spade or cutter under the basal plates of the plants to be removed. The plants can then be lifted, the remaining roots trimmed off with a sharp knife, and any damaged outer leaves stripped off.

The quality of celery, like that of most other vegetables, falls off progressively the longer it is kept after harvesting. Falling off in quality is less important if celery is to be used in soups or stews than if it is to be used for salads. Good produce may be stored up to 2 to 3 weeks at cool to near freezing temperatures and though some of the inferior types of celery which are often grown for early use are best used (if for salads) immediately after harvesting, all varieties of celery, whether early or late, can be stored in a refrigerator or in a trench if it is in a sufficiently cool, shady part of the garden.

Where celery is stored in a trench ventilation must be good, or rots are likely to develop. The plants should be stood upright so that the bases, either partially or cleanly trimmed, rest in the cooler, moist soil at the bottom. The trench can be covered with two fairly wide planks set to form a ridge to turn rain and provide shade.

Though celery does not tolerate low temperatures in the early stages of its growth—low temperatures may cause premature seed stalk development—when past the seedling stage and well established it thrives if the weather is relatively cool.

Liquid Manure

As celery is a moisture-loving plant and as its fertiliser needs are high, liquid manure is usually helpful where conditions tend to be dry and soil fertility is low. Blanching of the main crop is usually begun in most home gardens in March, early or late in the month according to growth of the crop, variety, and district. Most self-blanching varieties can be blanched in from about 10 to 21 days, but with the non-self-blanching varieties blanching may take about 14 to 40 days according to variety, temperature, the extent

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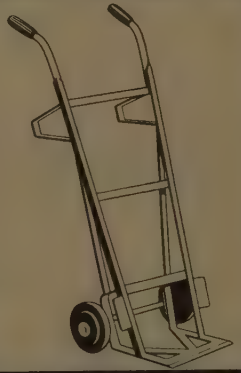

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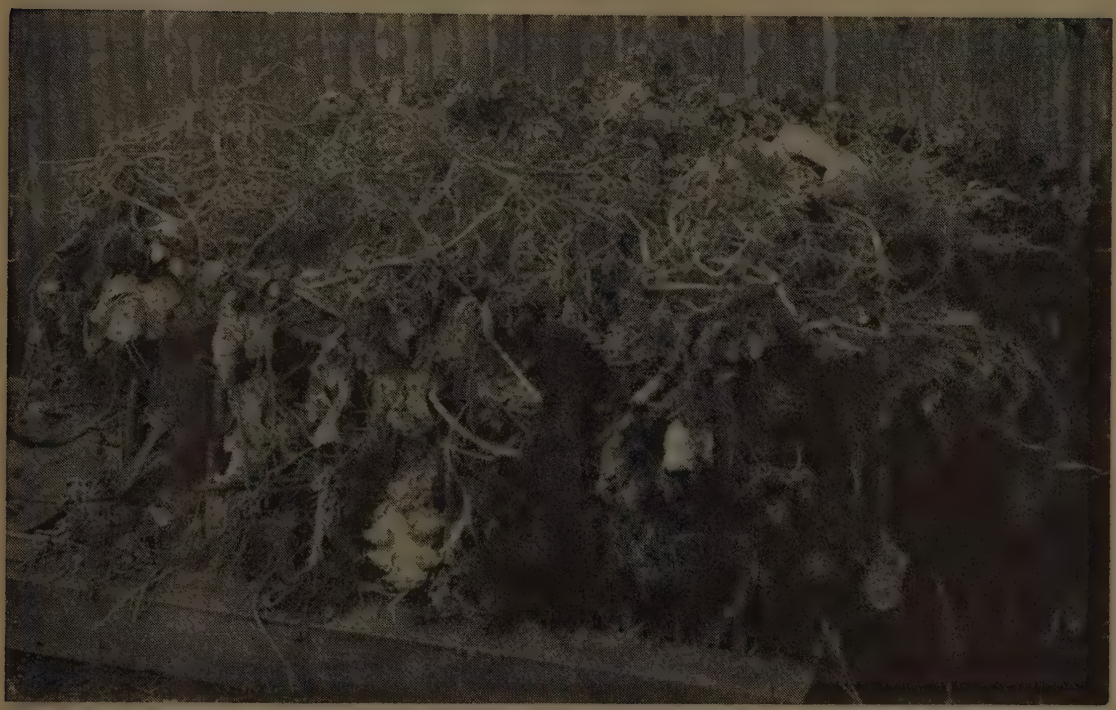

[*Green and Hahn*

Organic matter, whether it is farmyard or animal manure, rotted straw, rotted sawdust, leafmould, compost, or crop residues (above), is needed more than anything else to improve the cropping capacity of many home garden soils.

of blanching desired, and whether it is done in stages.

Self-blanching celery is usually blanched by placing 10in. by 12in. by 1in. boards held in place by pegs round the sides of the beds. Stiffened paper can be used if desired in place of the boards. The non-self-blanching type of celery can be blanched similarly, but as a much longer period is needed for blanching, plants are usually either wrapped individually in stout paper held with string or elastic bands, or earthed up in fine weather with clean, free-working, reasonably dry soil which preferably should contain little organic matter likely to cause rots and is free from the eggs of slugs or similar harmful creatures. Small or decaying outer stems should first be removed.

Earthing up is the most difficult way of blanching and, when finished, the banked earth should be ridged sharply and the soil surface beaten smooth with a spade to shed rain. Under wet conditions rots may develop if soil remains touching the inner stalks after earthing up and the stems should therefore be drawn together with the soil packed around them.

Blanching with clean, odourless paper is quite satisfactory and a long strip of strong paper can be placed along the sides of the bed and held in position with heavy arched wires. Blanching tends to check growth and therefore should not be begun until the plants are well on toward maturity. If, however, a good head of leaves is left at the top and soil is used for blanching and is not too tightly packed, plants should continue growing. Self-blanching varieties contain very little chlorophyll in their leaf stems or petioles and can be blanched very simply and quickly with paper or boards.

Home gardeners who have a large planting of one variety of celery and who intend to harvest it over a long period can begin blanching when the plants are about two-thirds grown.

Celery Leaf Spot

Celery leaf spot is the most serious disease of celery and often injures foliage severely and blemishes the outer leaf stalks. It may be seed borne and often infection starts from the seed. Leaf spot may be caused by one or other of two closely related fungi which give rise to somewhat different though superficially similar symptoms.

When fine, dry weather prevails after planting the spread of the disease may be slow, but if a spell of wet weather intervenes or overhead irrigation is resorted to, the spread may be rapid. Damage is usually worse when the weather allows plants to grow only slowly while the fungus can develop quickly. These conditions are usually during dry weather when there is not enough soil moisture for good plant growth but there are cool, dewy nights followed by dull days. Plants may be moist for the greater part of the day and this enables the fungus to develop so rapidly that the plants are unable to overcome the attack, as they grow very slowly.

Control consists of spraying with bordeaux mixture or one of the newer certified therapeutants, some of which give very effective control without causing damage as bordeaux sometimes does.

Chives

Chives are a useful mild substitute for spring onions, and young plants, which are usually obtained from the division of old stock, can be set out in March 12in. apart. Once established the plants can be cut regularly to obtain a succession of young leaves for use in salads, sandwiches, or for flavouring. Chives make an excellent border for the vegetable garden and

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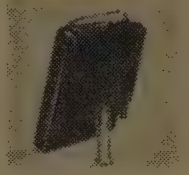

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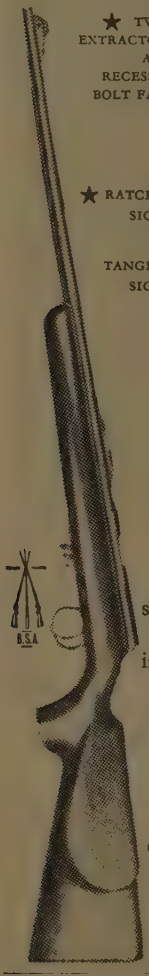

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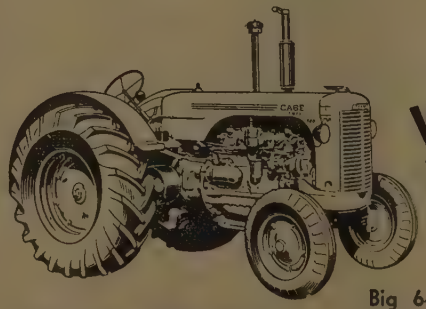

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CASE

[*Green and Hahn*

Maturity in onions is indicated by the tops drooping while the leaves are still green and by the gradual drying of the roots. Curing may take 3 to 4 weeks after this.

are usually dug up, divided, and replanted every third year. Stock for planting is obtainable from most nurserymen.

Kumara or Sweet Potato

Most varieties of kumaras or sweet potatoes are likely to be injured when the temperature falls to about 40 degrees F. (8 degrees above freezing) and the keeping quality is likely to be so seriously affected that long storage is impossible. Where the kumara crop is mature and long keeping is intended digging should begin before temperatures fall too low. Elsewhere cultivation can be carried on to assist the crop to mature.

Cultivation of kumaras includes control of weeds, maintenance of the height and shape of ridges, and, where necessary, lifting of the vines to prevent their rooting. Such rooting appears to favour leaf rather than tuber development. Weed control should be very strict, as kumaras are poor competitors with weeds, which reduce yields and hinder harvesting.

Onions

As soon as the neck of the onion bulb loses enough of its stiffness to allow the top to fall or bend over readily the onion is ready to harvest. This stage can be detected readily by the drooping of the tops just above the bulbs while the leaves are still green.

Gradual dying back from the tops of the leaves while the necks remain rigid, erect, and thick is an indication of abnormal ripening and usually poor keeping quality. Insect pests or some inherent weakness in the plant may be responsible. There is likely to be a percentage of this type in practically all crops. With the healthy, well-grown onion that is ready or nearly ready for harvesting the roots lose their hold on the ground as they gradually die and the neck softens, owing to the transferring of the soluble solids of the leaves into the bulb, until the outer crust of the bulb nearly closes the opening of the inner scales.

After maturing, bulbs should be cured by being turned regularly to dry them evenly if the crop is not harvested.

Harvesting

Correct harvesting has an important bearing on keeping quality and, apart from maturity, the important factors in deciding when to begin harvesting the crop are the state of the weather and whether the onions are for long keeping or for early use. The tops should be allowed to dry out as much as possible before they are trimmed or twisted and an inch or two of the tops should be left if trimming is done to avoid the exposure of the succulent tissues of the fleshy scales of the bulb. Careful handling to avoid bruising and proper drying of the bulbs have a very important influence on the keeping of onions. Where the soil is wet onions are usually late in maturing or drying off.

If thrips are still troublesome, onions should be sprayed to reduce infestation, as thrips reduce the effective green leaf area and so check the development and ripening of the bulbs. The adult onion thrips is a minute, slender insect. Adult females

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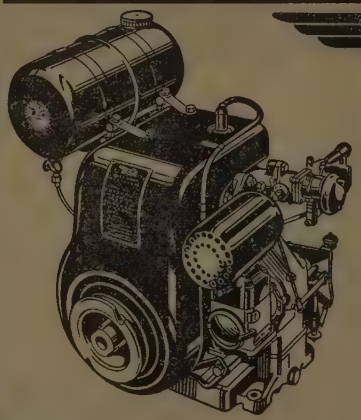

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are winged, very active, and capable of reproducing without mating. Thrips lay eggs singly in the tissue near the bases of the onion leaves and from these eggs small yellowish nymphs emerge. They are then at the first of four nymphal stages.

During the first two stages nymphs feed at the bases of the leaves, where they are well protected in the throat or chit of the onion. The last two nymphal stages are passed in the soil at the base of the plant. The adult thrips feed over the entire leaf by puncturing the leaf surface and imbibing the exuding sap. Damage to the leaf surface causes whitish blotches and lowers the vitality of the plant.

HETP or nicotine sulphate sprays give some control, but the best results in trials were obtained by combined sprays which included substances such as HETP, nicotine sulphate, or lindane, which gave an immediate kill, with substances such as DDT or parathion, which had a residual killing effect.

Potatoes

In districts where potato crops are likely to be attacked by late blight they should be sprayed with bordeaux or a certified substitute unless digging is to be begun without delay. If potatoes for keeping for several months are dug when unripe, heavy loss in storage is likely. Where the crop is mature and late blight is present but time does not permit digging, the haulms should be destroyed, preferably, in the home garden, by pulling them off and burning them.

Haulm destruction is recommended as a control for potato blight on mature infected crops which cannot be sprayed thoroughly or dug at once. The blight fungus continues to produce spores as long as green haulm remains. Heavily infected haulms should therefore be removed or killed promptly, as otherwise there is risk of contamination of the tubers at lifting time. Risk of contamination remains even 10 to 15 days after the haulm dies or is killed.

Commercially haulm destruction by chemicals such as sulphuric acid, sodium chlorate, dinitro compounds, or copper compounds is useful in preventing losses from blight, particularly in crops for storage, because if a crop is subjected to heavy rain, spores from infected haulms will be washed down and will infect the tubers below.

Potatoes are mature when the skins of the tubers are firm and do not rub off easily. While top growth is healthy and vigorous tuber growth will continue. The tops therefore give the first indication of crop maturity. Experiments to test the effects of haulm destruction on the setting or the maturing of the skins of tubers indicate that skin setting or hardening during maturation of the haulm is gradual, speeding up as the haulm yellows and dies and continuing for some time after the death of the haulm.

Tomatoes usually do well in a sunny, sheltered position against a fence.

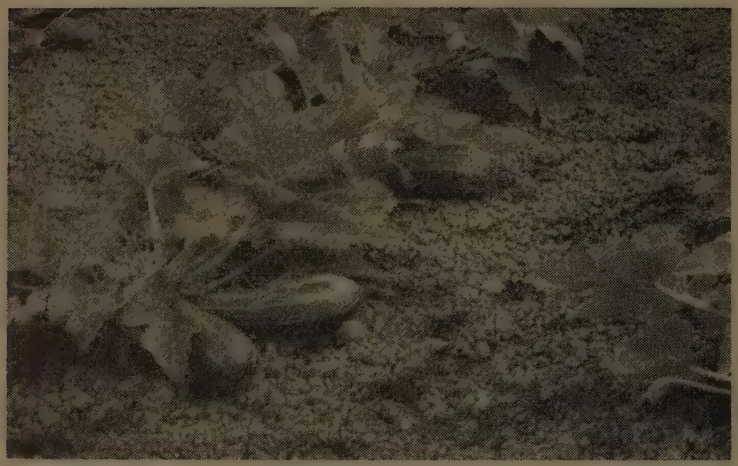
Spring Cabbages

Cabbages for spring cutting from the first February sowing should now be developing well. Seedlings should be sprayed where necessary with DDT against caterpillars and thrips and with HETP or nicotine sulphate if aphides are present. Mildew often becomes troublesome as dampness becomes more general with the advance of autumn, particularly where heavy dews and cooler conditions prevail. Bordeaux or copper oxychloride will control mildew, but sprays are sometimes difficult to apply, as the small leaves of cabbage and cauliflower seedlings tend to lie flat under spray pressure.

A spray with a fine jet which disperses the spray into very fine droplets which drift as a mist is most effective, but an added wetter such as a few drops of household detergent is usually helpful in enabling the spray to wet the leaves.

Home gardeners often remove plants from the seed-bed and set them out when they are very small. This practice is advisable only if the garden is sheltered and conditions are favourable. Plants for spring cutting are usually set out in April. They should be sturdy, close jointed, hardy, and well developed and should be lifted with a fibrous tuft of soil and roots.

In the home garden, where there is usually no delay between lifting and setting out the plants, it should not be necessary to puddle roots in thick,



[*Sparrow*

The fruit of plants such as marrows and pumpkins should be protected from frost if intended for long storage.

muddy water to keep them moist as is sometimes done under commercial conditions. When the plants are lifted the top growth can be dipped in a solution of DDT and nicotine sulphate if aphides and caterpillars are troublesome.

Spring Cauliflowers

Where winters are not too severe cauliflowers for spring use can also be raised in autumn. Cauliflowers are more sensitive to adverse conditions than either cabbage or broccoli, but they can be grown on almost any well-drained soil, provided it is well supplied with plant food and moisture. Soils should be deeply cultivated and rich in well-rotted organic matter supplemented by a good fertiliser.

Cauliflowers must be able to grow continuously or the curd or flower may not develop properly. Most soils should be limed annually at about 2oz. to 3oz. of carbonate of lime to the square yard some time before planting. More may be necessary in higher-rainfall areas.

As cauliflowers must not be checked and the curd is liable to frost damage, seed sowing must be arranged to suit the climate. Plants should not be overwintered in the field where the weather is cold enough to check growth severely and they cannot be grown successfully where conditions are excessively dry as in some districts in the late summer or autumn. Very cold winds have also been known to affect curd development adversely. Except in mild climates plants for setting out in early spring should be raised in autumn or winter, either under glass or in very sheltered situations.

The seed-bed for cauliflowers should be well drained and worked to a very fine tilth. Seed should be sown ¼in. to ½in. deep, preferably in rows, as the soil is easier to cultivate and the seedlings are usually easier to lift than when seed is broadcast. Good varieties for overwintering or spring planting include All Seasons and Walcheren.

Successional Sowings

The number of subjects that can be sown now in most districts with prospects of their maturing before winter is comparatively small. Quick-maturing varieties of spinach, radishes, turnips, and beetroot can be sown early in the month, but even with these vegetables success in most districts depends largely on factors such as weather, situation, and favourable cultural treatment.

Soil for all the above subjects should be well drained and rich in plant nutrients and humus. Quick growth is essential if good quality is desired. The soil should be deeply dug and cultivated to a fine tilth. Soil lacking humus can be improved by the thorough incorporation of compost or well-rotted farmyard or stable manure.

Seed can be sown ¼in. to ½in. deep in rows 12in. to 15in. apart. The ordinary type of radish can, however, be sown in rows 6in. to 9in. apart or broadcast in prepared beds, which for convenience when radishes are being gathered should not be more than about 3ft. wide.

Plants such as lettuce, silver beet, and cabbage or cauliflower can also be sown to mature in spring, but in the colder districts a warm, sheltered, well-drained situation should be chosen.

Show Dates

THE following are dates and venues of A. and P. shows up to the end of April:—

NORTH ISLAND

March

*3 March—Whakatane A. and P. at Whakatane.
3 March—Waiotira Junction A. and P. at Waiotira.
3 March—Mangonui County A. and P. at Kaitaia.
3 March—Albany A. and P. at Albany.
3 March—Waikato Central A. and P. at Cambridge.
*7 March—Morrinsville A. and P. at Morrinsville.
7 March—Opotiki A. and P. at Opotiki.
10 March—Kumeu District A. and H. at Kumeu.
10 March—Hawke's Bay A. and P. at Hastings.
*17 March—Wellsford A. and P. at Wellsford.

SOUTH ISLAND

March

3 March—Amuri A. and P. at Rotherham.
3 March—Temuka and Geraldine A. and P. at Winchester.
10 March—Cheviot A. and P. at Cheviot.
10 March—Mt. Benger A. and P. at Roxburgh.
*13 March—Lake County A. and P. at Arrowtown.
17 March—Hawarden A. and P. at Hawarden.
17 March—Mayfield A. and P. at Mayfield.
17 March—Upper Clutha A. and P. at Wanaka.
*24 March—Methven A. and P. at Methven.

April

2 April—Mackenzie County A. and P. at Fairlie.
2 April—Strath-Taieri A. and P. at Middlemarch.
7 April—Oxford A. and P. at Oxford.
14 April—Malvern A. and P. at Sheffield.

* The Department of Agriculture exhibit will be staged at this show.

Agricultural and Horticultural Correspondence Courses

THE 1956 prospectus of the Department of Education's Technical Correspondence School is very comprehensive, including agricultural, horticultural, and dairy manufacturing courses as well as a wide range of courses in other trades and professions.

The school was established in 1946 to provide instruction in these subjects for students who cannot attend classes at a technical school. The tuition is strictly vocational and is designed for students who are in an industry or profession and are thus gaining practical experience in work related to their correspondence courses.

The agricultural courses cover dairy farming, sheep farming, and arable farming. Also available are short courses on farm bookkeeping, milk, and concrete for the home and farm.

The horticultural courses are for the junior and intermediate examinations for the National Diploma of Horticulture conducted by the Royal New Zealand Institute of Horticulture. There are also courses for horticultural apprentices.

Dairy manufacturing courses include buttermaking, cheesemaking, factory management, and milk.

Other courses include carpentry and joinery, electrical trade, engineering, fitting and turning, industrial management, mining, motor trade, plumbing, radio trade, surveying, television, textile manufacture, and valuation (for examinations of the New Zealand Institute of Valuers).

Further information may be obtained from the Principal, Technical Correspondence School, 29 Wallace Street, Wellington S1.

Controlling Infertility in Dairy Cattle

THOUGH infertility was still a heavy and persistent drain on the dairy industry, possibilities for its control were much more hopeful than they were 3 or 4 years ago, according to a paper presented by Dr. J. P. James, Superintendent of the New Zealand Dairy Board's Artificial Breeding Centre, Newstead, Hamilton, to the 1955 Ruakura Farmers' Conference. An adaptation of Dr. James's paper follows.

IN dealing first with the principles which apply in the control of all reproductive diseases, there is first the policy of maintaining a closed herd. Generally this is so important that it should be aimed for all the time, even though on occasions new stock must be bought in. The first important point then is the policy of the closed herd.

When it is impossible to maintain a closed herd the safest replacements are sexually immature animals, not older than the yearling stage. Even then they should be blood tested for *Leptospira* and be vaccinated against contagious abortion. The policy of buying in young stock is thus the second important point.

If an adult animal of either sex is introduced into a previously clean herd, the chances of its bringing disease with it are considerable. The third point is that the greatest care should be taken to test all introductions. Fortunately diagnostic tests are available and farmers should make use of them.

When newly acquired stock, or for that matter any stock, abort, the cause should be diagnosed. The heifers bought in calf may have been vaccinated against contagious abortion, but unfortunately there are three other possible infective causes, vibriosis, trichomoniasis, and leptospirosis, which can bring rather different but also very expensive trouble. The fourth point is that all abortions should be diagnosed.

The fifth point, and one that has been rather neglected in this era of vaccines and antibiotics, is the need for cleaning up and disinfecting after abortions and any subsequent discharges.

The sixth point is that these aborting animals should be treated, as a very good recovery rate can be expected, especially with the use of antibiotics, which are available at a reasonable price.

Though a farmer may have done everything in his power to maintain the principle of the closed herd, accidental matings to stray cattle do occur even when the boundary fences are new. It must be realised that one such accident can undo all the work that may have been put into keeping a herd as a healthy self-contained unit. A bull infected in this way can infect the whole herd before anything is found amiss. Similarly one of the cows may get a similar infection from a stray bull which she will pass on to her own herd bull and so on round the herd. In such a case it is usually easier and quicker to test the cow involved, and this should be done so that appropriate treatment can be done immediately. This is point seven: Prompt treatment in these circumstances will prevent expensive breeding trouble later.

The eighth and final point in this general discussion is the special attention that should be given to excluding disease when mature bulls are bought. Unfortunately bulls can be actively infected with contagious abortion, vibriosis, and trichomoniasis without showing any symptoms. In some cases diagnostic tests are not as easily obtained as in the cow, and so considerable care should be taken in going over the immediately preceding records of any bull which is being bought after work in another herd.

HEADING PHOTOGRAPH: Naturally a lot of thought is being given to the exclusion of all transmissible diseases from the bull stud, and when this work has been provided for those farmers trying to improve production by breeding there will still be a demand for expansion from those who require it more as a disease control measure. The illustration shows farmer interest in the New Zealand Dairy Board's bull stud at the Artificial Breeding Centre at Newstead during a Ruakura Farmers' Conference field day. Niederer photograph.

Diseases Affecting Fertility

Contagious Abortion

Contagious abortion is still an important factor in cattle infertility, and some workers believe that it is even now the most important one, in spite of the very high degree of success following calfhood vaccination. Two years ago the writer estimated that only 70 per cent. of the total heifer calf population was being vaccinated in any one year. The protection afforded individual animals by vaccination does not eradicate the disease from herds. Each group of heifer calves must be vaccinated between the ages of 5 and 8 months.

The strain 19 vaccination of heifer calves is without doubt the most positive control measure yet in bovine infertility, and the cost is so trifling in relation to the benefits that it is hard

to understand why so large a proportion of heifer calves are not protected each year. There seems to be good reason for vaccinating all bull calves at the same age, unless they are intended for export.

The question of revaccination often arises. Though this has been done with good effects in some herds, it is not a measure which can be recommended as a routine. The decision must be left with the veterinarian in charge of the herd.

Vibriosis

Vibriosis has come into prominence quite recently, though it was known to exist over 40 years ago. It is extremely widespread and must be regarded as a serious danger to reproductive efficiency in cattle. The important difference from contagious abortion in its method of spread is that this disease is spread only by the bull. Contagious abortion is usually picked up by animals eating infected pasture. As vibriosis is spread only through service by an infected bull, the closed herd principle applies without reservation in the control of this disease. When breaks occur diagnosis is relatively easy in the cow, though not necessarily on the first examination, but more difficult in the bull. There is no vaccine available, but treatment with streptomycin has proved very effective in the cow, and well worth while attempting in the bull. In many herds in the Waikato which have had infertility due to *Vibrio foetus* infection a whole herd treatment with streptomycin has proved very encouraging. It is, however, better in the long run to keep clear of this trouble by testing and if necessary treating all new introductions into the herd. Now that the antibiotics are available at a reasonable price the control of vibriosis looks much more hopeful.

Trichomoniasis

Like vibriosis, trichomoniasis is strictly venereal in its location in the animal and in its method of spread. Though it is known to exist in all dairying districts in New Zealand, it is not as common as the two previous diseases mentioned. In the cow or heifer it can be relatively easily diagnosed and treated. In the bull positive diagnosis is troublesome, and for practical purposes treatment is out of the question. As for vibriosis, new introductions into a previously clean herd and accidental matings with stray cattle are the only natural ways of starting this trouble.

In Great Britain it has been said that since artificial breeding was introduced trichomoniasis has ceased to become a problem. Now that artificial breeding is available in most districts in New Zealand there is no reason why use could not be made of it in controlling trichomoniasis. The heavy commitments made by the bull centre for October and early November may preclude any promises of help at that time, but from the middle of November onward it would be possible to provide semen for these cases. Where artificial breeding is not available to assist, and the trouble is diagnosed during the active breeding season, it is better to carry on with the infected bulls than bring in fresh ones only to get them infected from the cows. At the end of the breeding season the bulls must be discarded and any cows carried over must be treated, and all cows, even those which calve normally, should be allowed three open heats before mating to a clean bull.

Bull's Share in Infertility Problem

Just as the bull is sometimes regarded as half the herd from the production viewpoint, he unquestionably is from the fertility angle. Emphasis has already been given to the major part he plays in spreading vibriosis and trichomoniasis through a herd. A normally fertile bull will under these circumstances give disappointing results. On the other hand a clean bull can also give poor conception rates due to low inherent fertility. It seems that about one bull in ten may be expected to give poorer than average results. If the bull is suspected of giving poor results, and good breeding records are the best way of making sure, a semen examination may be of help in determining whether it is wise to continue using him that season.

In connection with the feeding and management of bulls, it is believed, as a result of experimental work with identical twin bulls, that in New Zealand maintaining good body condition is more important than worrying about specific food components. It has also been shown that it is wiser to limit the use of yearling bulls to 12 to 14 heifers if they are pastured together or double that number if hand served. It is also a sound policy to limit the use of adult bulls to the accepted 30 to 40 heifers per season.

General Herd Management

Two points are considered important in general herd management. The first is the keeping of clear breeding records. A good set of these records may save a great deal of time if trouble with the bulls is suspected. The standard shed sheet as issued by the Herd Improvement Associations, or an exercise book ruled to give the record of each cow along the page, is much easier to follow than the chronological type, where the day's happenings are recorded on each page. Apart from the evidence that such a record can give about the performance of each bull and cow, it is often of great help to know which cows are about due on heat, so that special care can be taken that quiet heats are not missed.

The second point in general herd management is the practice of mating cows too soon after calving. This is a great temptation when an attempt is being made to make up lost time with late calvers. Results whether by natural or artificial breeding are definitely worse up to 60 days after calving than after that interval. This is particularly important when a bull is used, as the risks of contamination are obviously greater close to calving.

Artificial Breeding and Control of Infertility

Since so much emphasis has been placed on the disease aspects of infertility, and since it has been shown that the bull is the means of spreading the trouble in at least two of the important diseases, if clean bulls are located at the Artificial Breeding Bull Centre, quite a number of farmers will be as interested in artificial breeding for disease control as for straight production. Already there are some farmers whose main aim in joining the artificial breeding work has been disease control rather than production improvement. Naturally a lot of thought is being given to the exclusion of all transmissible diseases from the bull stud, and when this work has been provided for those farmers trying to improve production by breeding, there will still be a demand for expansion from those who require it more as a disease control measure.

Other Causes of Infertility

There are, of course, many other causes of infertility in dairy cattle besides the main ones described. In many such cases it is much more difficult to define the cause than to prescribe control measures. If it has been proved that infertility is present because some mineral component of the ration is lacking, in spite of the fact that the cattle are healthy in other respects, nothing could be easier than to make up that loss by drenching or topdressing. Errors of nutrition are important in some cases, but in New Zealand they should be considered only after the disease and bull aspects of the problem have been investigated.

In spite of the heavy losses that infertility causes annually, its control is much more hopeful than it was even 3 or 4 years ago. Those measures touched on very briefly in this article, are all being applied by practical farmers. Skilled diagnostic services, efficient new drugs, and a close artificial breeding network are available to help overcome this heavy and persistent drain on farm income.

Casserole Dishes for the Inexperienced Cook

FEW homes do not at some time pass through a period when meal planning and cooking have to be done by someone other than the housewife. To those who in emergency have to undertake these very important duties a few simple, well-tried recipes requiring no exotic ingredients and no involved methods of preparation will be helpful, and to this end the following recipes have been collected by Maud B. Strain, Field Officer in Rural Sociology, Department of Agriculture, Dunedin.

IF a satisfactory standard of nutrition is to be maintained, some forethought is necessary. Grilling is one of the quickest methods of cooking meat, but too many meals thus cooked become monotonous as well as being expensive, because generally only the best cuts are suitable for cooking this way. The cheaper cuts are no less nutritious, and though they require longer, slower cooking, they require little or no attention during the process. This singles them out as particularly suitable for the part-time cook. However, planning ahead is necessary; with such planning and a collection of well-tried recipes the amateur cook can serve an appetising and satisfying meal, even though she may have been occupied elsewhere during most of the cooking time.

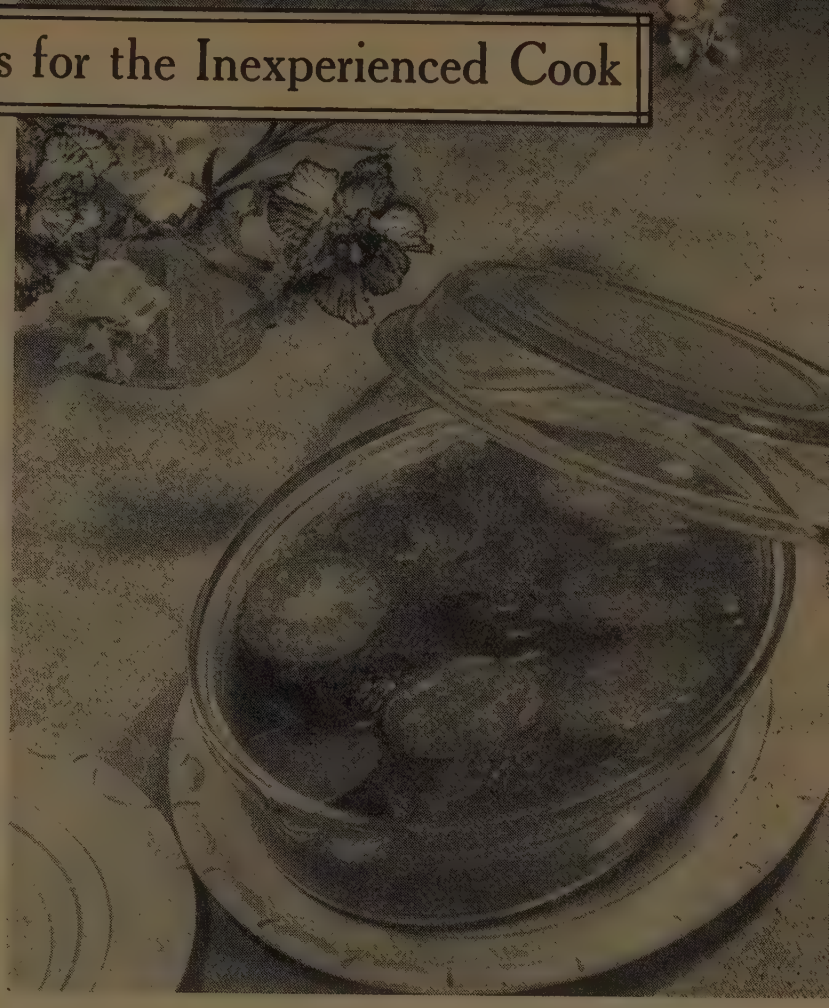
Braising, Stewing, and Pot-roasting

The following recipes are suitable for cooking in a casserole in the oven at a low temperature, or for cooking on top of the range over low heat. The dishes are stewed, braised, or pot-roasted, the method being similar in all. The meat is cooked by moist heat at a low temperature in a closely covered vessel, thereby retaining its flavours, suffering the minimum amount of shrinkage, and losing none of its nutrients, because the liquid in which it is cooked is eaten with the meat.

Braising, pot-roasting, and stewing are all names for the same method of cooking. If a joint, poultry, or game is being cooked whole by this method, it is usually referred to as pot-roasting; steak, whole chops, or sausages are braised, whereas meat cut into small cubes or pieces is stewed. Suitable vegetables may be cooked in the casserole with the meat.

Advantages of Casserole Cooking

The advantages of casserole cooking are that foods can be prepared and cooked the night before they are needed and reheated when required, or they can be put in the oven at lunch time and at the low temperature at which they are cooked will be ready for the evening meal.



Swiss steak in which fresh tomatoes have been used. [*Sparrow*

One or two practical points should be borne in mind: The cook must be able to regulate the oven to remain at a constant temperature or not to rise above a particular temperature; thickening must not be added to anything cooking on the range top until the end of the cooking period so that it will not stick and burn.

A casserole cooked in the oven requires rather more liquid than one on the range top, but where expediency demands it thickening can be added to a dish being cooked in the oven at the beginning of the cooking period without harmful results. Further points are that where vegetables can be cooked with the meat not so many cooking pots are necessary with consequent less washing up, and any nutrients lost from the vegetables are retained in the gravy and not poured away in the cooking water.

Method of Preparation

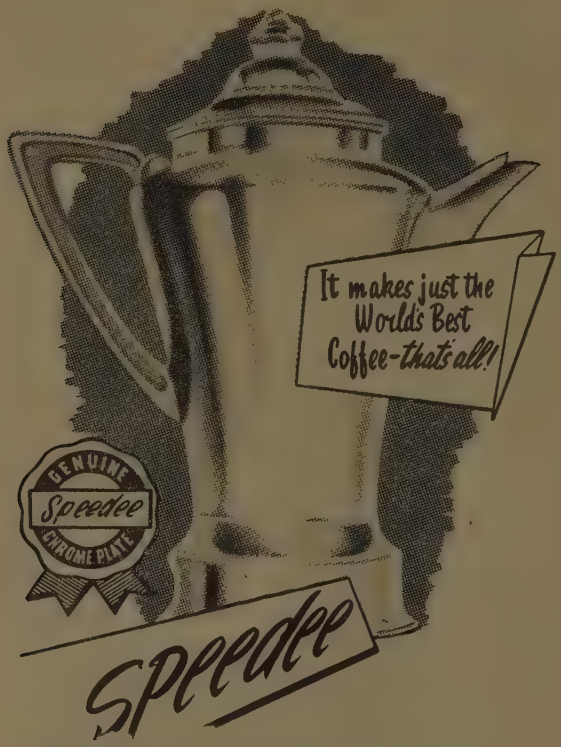
The method of preparation of the meat is similar for most stews.

Wipe the meat with a clean, damp cloth and cut off excess fat, cut the meat into 1in. cubes, and dredge it with flour to which salt has been added in the proportion of 1 teaspoon to each tablespoon of flour.

For a brown stew brown the meat in a small amount of fat in the vessel in which it is to be cooked, being careful not to burn it. (If onion is being used, brown it before browning the meat.) Vegetables can also be browned lightly, as this introduces more flavours and helps to make a rich-coloured stew.

Pour off any excess fat, add seasonings of salt, pepper, spices, herbs, and vegetables as desired to the meat, and cover it with water or stock.

Put the cover on the casserole and cook the meat very gently until it is



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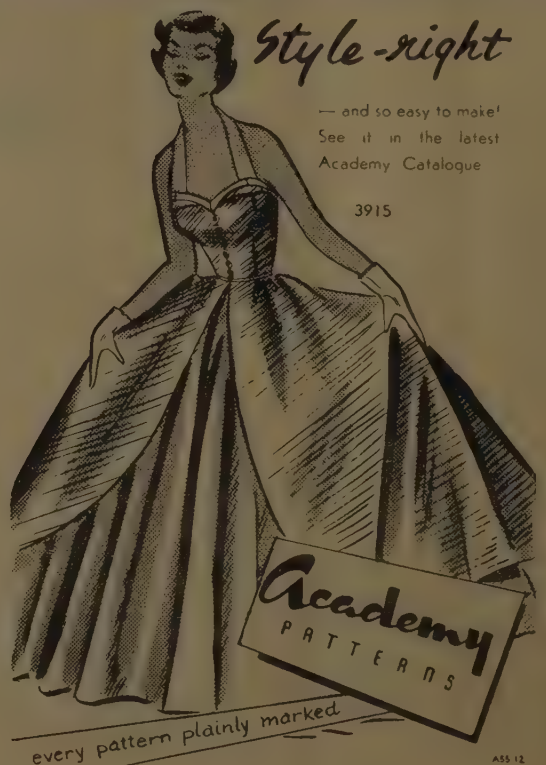

tender when tested with a fork (mutton usually requires not less than 2 hours and beef not less than 3 hours). Add vegetables cut into pieces approximately the same size as the meat ½ to ¾ hour before the end of the cooking time. If the recipe requires dumplings, add these 20 minutes before serving time, after thickening the stew.

Serve the meal hot from the dish in which it was cooked.

For thickening stews use 1 to 2 tablespoons of flour to each cup of liquid (any excess of seasoned flour used for dredging the meat can be used for thickening). Mix the seasoned flour with a little cold water to the consistency of thin cream. To this add a little of the liquid from the stew. Mix these well together, then add this thickening to the stew, stirring carefully to avoid lumps, until the liquid has thickened. Guard against subsequent sticking by not allowing the thickened stew to stand over a direct source of heat.

In recipes which require the meat to be seared on the outside or lightly browned it is not advisable to do this one day and leave the rest of the cooking until the next day, because though the outside surface may be cooked, the inner part of the meat will be only warm—a temperature at which deterioration is rapid. Searing of the outside should be followed by cooking for at least half the required time; this ensures that the meat will be sterilised and will not deteriorate before cooking is completed.

Pressure Cookery

Another excellent method of preparing meals quickly is to make use of a pressure saucepan. This, however, is a subject in itself and beyond the scope of this article.

▲ Frying the vegetables in hot fat until they are lightly browned is a method of introducing added flavour to a meat and vegetable casserole.

▼ A curry sauce can be prepared the day before it is needed. The onions should be fried lightly, after which the other ingredients, except the meat and thickening, should be added and the whole cooked for 20 to 30 minutes to blend the flavours.

▼ Topside of beef is most suitable for pot-roasting. Vegetables are added at a suitable time during cooking and all are browned by removing the cover, basting the meat, and putting the pot in the oven for ½ hour. Sparrow photograph.

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Summer Days Suggest these Delicious New Desserts

FRUIT IN THE SNOW

1 tin of Fruit Cocktail (drained)
1 packet EDMONDS Jelly Crystals
1 teaspoon grated Lemon Rind
2 Egg Whites

Drain syrup from the fruit and add water to make up to 1½ breakfast cups of liquid. Heat and pour over jelly crystals, stirring until dissolved, add grated lemon rind. Arrange a little fruit in individual moulds, cover with a little jelly. Chill. When remainder of jelly is setting, beat until frothy, then fold in the stiffly beaten egg whites. Fold in 1½ cups of fruit cocktail. Spoon into moulds over clear layer. Leave to set. Turn out and garnish with remainder of fruit.

PINEAPPLE TRIFLE

1 packet EDMONDS Pineapple Jelly Crystals
1 pint hot water
1 stale sponge
1 small tin of Pineapple
1 pint of EDMONDS Custard
Whipped Cream

Dissolve jelly crystals in hot water and set aside to cool. Cut sponge into small pieces and put into a dish. Pour over pineapple juice and pineapple cut small. Make custard and pour over sponge, etc. When jelly begins to set, whip to a stiff froth and pour over the trifle. Before serving, decorate with whipped cream.

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Recipes

In the following recipes all measurements are for standard measuring cups (8 fl. oz.) and standard measuring spoons, and are level measurements.

Steak used in these recipes is topside, thick flank, blade, or chuck.

Beef Stew

1lb. of steak
2 tablespoons of flour
2 teaspoons of salt
Shake of pepper
1 medium-sized onion
2 medium-sized carrots
1½ to 2 cups of water

(4 servings)

Prepare the stew according to the directions given for brown stew above. Serve it with dumplings.

Dumplings

4oz. of flour
½ teaspoon of salt
2 teaspoons of baking powder
½ cup (approx.) of milk
1½oz. of suet (optional)

Sift the flour, baking powder, and salt together. Chop the suet finely and mix it in with the flour mixture. Add the milk and mix it in lightly with a knife to make a soft dough that will fall from a spoon. Drop tablespoonfuls into the stew. Cover the stew tightly and allow it to simmer gently for 30 minutes without lifting the lid.

French Steak

1½lb. of steak
1 tablespoon of Worcester sauce
2 tablespoons of flour
1 teaspoon of sugar
1 tablespoon of vinegar
½ teaspoon of mustard
¼ teaspoon of baking soda
2 tablespoons of tomato sauce
2 teaspoons of salt
1½ cups of water

(6 servings)

Cut the steak into pieces of a suitable size for serving. Mix the dry ingredients and sauces together in a basin, add the water, and stir the mixture well. Place the meat in a casserole and pour the mixture over it. Allow the casserole to stand covered for ½ to 1 hour. Bake the dish slowly for 3 hours at 300 degrees F.

Swiss Steak

2lb. of steak
2 tablespoons of dripping
1oz. of flour
1 teaspoon of salt
Few shakes of pepper
1 medium-sized onion (sliced)
1 cup of tomatoes preserved whole, puree, or juice, or ½lb. of fresh tomatoes

(4 servings)

Mix the salt and pepper with the flour, then pound the seasoned flour into the steak. Cut the steak into pieces of a size suitable for serving and sear it on both sides in the hot dripping. Place the pieces in a casserole and add the onion and tomato and sufficient water or stock barely to cover the meat. Cover the casserole and bake the steak for 2½ to 3 hours at 300 degrees F.

Braised Steak and Onion

2lb. of steak
4 large onions, sliced
2oz. of butter
1 teaspoon of sugar
2 teaspoons of salt
Few shakes of pepper
2 tablespoons of flour
1½ cups of stock or water

(6 servings)

Fry the sliced onion in the butter in a casserole until it is well browned (a teaspoon of sugar sprinkled over the onion helps in the browning but increases the tendency of the onion to burn if it is not watched). Trim off any fat and cut the steak into pieces of a suitable size for serving. Mix the flour, salt, and pepper together and roll the meat in the mixture. Brown the meat lightly on both sides in the casserole with the onion. Pour off any excess fat, add the stock, and cook the mixture gently in the oven (300 degrees F.) for 3 hours until the meat is tender. Thicken the liquid with the remainder of the seasoned flour mixed to a thin, creamy consistency with cold water. Cook the mixture for a further 10 minutes and serve.

VARIOUS CASSEROLE RECIPES

The lid has been removed from this casserole to show green peas and tomato slices topping a foundation of braised steak and onions.

Steak and Kidney Pie

2lb. of blade steak
3 sheep kidneys
1oz. of flour
1 teaspoon of salt
2 cups of stock or water

(4 to 6 servings)

Prepare the steak for stewing. Wash the kidneys, skin them, and cut them in halves lengthwise and each half into six or eight pieces. Mix the seasonings with the flour and roll the meat and kidneys in the mixture. Put the meat into a casserole, stir in the remaining flour, add the stock, and cover closely. Bake at a low temperature (300 degrees F.) for 3 hours. When the meat is cooked transfer it to a pie-dish, cover it with short pastry, and bake it in a hot oven (400 to 450 degrees F.) until the pastry is golden brown—about 15 minutes.

Variation: Instead of the meat being transferred to a pie-dish it may be covered with the same mixture as is used for making dumplings. Cook the casserole for a further 20 to 30 minutes without lifting the cover.

Indian Curry

3 medium-sized onions
1oz. of butter
2 tablespoons of curry powder
1 tablespoon of vinegar
Grated rind of ½ lemon
1 teaspoon of sugar
2 apples (chopped)
1½ cups of stock or water
1½lb. of lean topside steak
2 tablespoons of flour
2 teaspoons of salt

(4 servings)

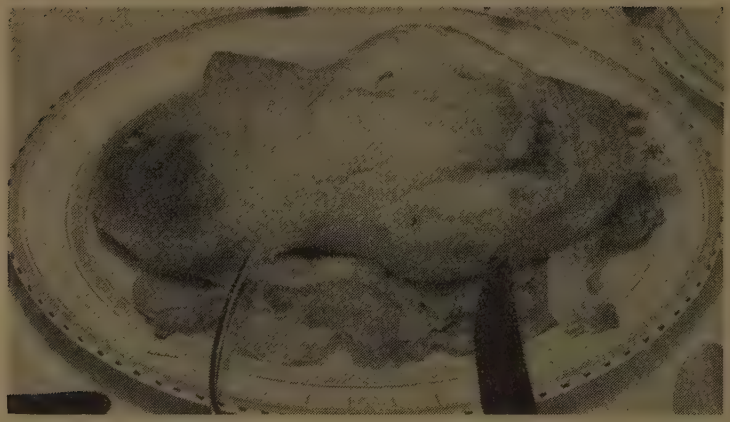
Fry the sliced onions in the butter in a casserole until they are golden coloured. Mix the curry powder, sugar, lemon rind, vinegar, and chopped apples together in a basin and add the stock. Pour this mixture on to the onions, bring the mixture to boiling point, and cook it gently for 20 minutes. Prepare the meat, cut it into inch cubes without fat, roll the cubes in the seasoned flour, and add them to the curry sauce. Bake the curry in the oven at 300 degrees F. for 2½ to 3 hours. Before serving it add 2 tablespoons of chutney and, if liked, a tablespoon of coconut. Serve the curry with a border of boiled rice.

Savoury Mince Pie

1½lb. of steak
1 medium-sized onion
1oz. of flour
1 teaspoon of salt
Pepper
½lb. of short pastry

(4 servings)

Put the steak and onion through a mincer. Put the mince into a small saucepan and cook it gently for 1 to 1½ hours. This should be simmered slowly and stirred frequently at first to prevent the meat forming into a solid mass. It should not be necessary



[*Sparrow*

An old fowl can be made as tender and appetising as a chicken by pot-roasting it in a casserole.

to add extra liquid; the pie will be better flavoured if the meat cooks in its own juices. When the mince is tender thicken it with the flour, salt, and pepper mixed with water to a thin, creamy consistency and cook the mince for a further 10 minutes. Transfer the meat to a pie-dish, cover it with short pastry, and bake the pie in a hot oven (400 to 450 degrees F.) until it is golden brown (15 minutes).

Braised Oxtail

1 oxtail
2 medium-sized onions
2 cups of water or stock
1 carrot (sliced)
1 turnip (diced)
1oz. of dripping
1oz. of flour
1 dessertspoon of chopped parsley
1 teaspoon of salt
¼ teaspoon of pepper

(6 servings)

Cut the tail into neat joints. Remove as much fat as possible and wipe the joints with a damp cloth. Roll the joints in the flour mixed with the pepper and salt. Heat the dripping in a casserole and fry the sliced onion until it is lightly browned. Lift the onion out of the fat and brown the meat lightly. Pour off any remaining fat, add the onion and the stock, cover the mixture closely, and bake it at 300 degrees F. for 3 hours. Half an hour before the end of cooking time add the prepared vegetables (if it is more convenient, they can be added at the beginning). When the meat is tender remove the joints and thicken the gravy. Return the meat to the casserole, reheat it, and serve.

Haricot Mutton

6 mutton chops (leg or neck)
1 large carrot (sliced)
1 small white turnip or ½ cup swede turnip
1oz. of flour
1 teaspoon of salt
1 medium-sized onion
1½ to 2 cups of stock or water
¼ teaspoon of pepper

(6 servings)

Fry the onion in a frying pan in a little fat until it is lightly browned, then fry the carrot and turnip similarly. Drain off as much fat as possible and place the vegetables aside while the chops are prepared. Trim the fat from the chops, coat them with the seasoned flour, and brown them lightly in the pan. Place the browned chops and vegetables in a casserole, add the water, cover the mixture closely, and bake it for 2 to 3 hours at 300 degrees F. Before serving the dish remove the chops and thicken the liquid with 2 tablespoons of seasoned flour mixed to a thin, creamy consistency with cold water. Cook this for a few minutes and serve it around the chops.

Hot Pot

2lb. to 3lb. of neck of mutton
3 onions
2lb. of potatoes
1 tablespoon of salt
Curry powder
1½ cups of stock

(4 servings)

Trim off the fat and cut the meat into pieces of convenient size for serving. Peel the potatoes and onions and slice them moderately thickly. Put a layer of sliced onions on the bottom of a casserole, then a layer of meat, and over that a layer of sliced potatoes. Sprinkle salt and a little curry powder on each layer. Continue in this way until the meat, potatoes, and onions are used. Place a few small potatoes on top and add water or stock until it shows through the top layer. Cover the dish closely and bake it until the top potatoes are cooked through and the meat feels tender when tested with a cooking fork (2 to 2½ hours at a temperature of 300 degrees F.). Sprinkle chopped parsley on top of the hot pot and serve.

Variation: For Irish stew use less meat, say 1½lb., and 1 onion only and omit the curry powder.

Fricassee of Mutton

4 mutton chops (rib)
1 onion
2 tablespoons of flour
1 teaspoon of salt
¼ teaspoon of pepper
Chopped mint
1 tin of peas

(4 servings)

Trim the fat from the chops and put them in a casserole. Add the peeled and sliced onion and sprinkle the mixture with the salt and pepper. Add sufficient milk almost to cover the chops. Cover the casserole and cook it slowly for 2 hours. Strain off the liquid and thicken it with 2 tablespoons of flour made into a thin consistency with the liquid from the tin of peas. Allow this mixture to cook for a few minutes, add the chopped mint and the peas, and pour the mixture over the chops. Reheat the mixture and serve it hot.

Jugged Rabbit or Hare

Rabbit
2 onions
1 teaspoon of mixed herbs
6 cloves
3 whole allspice
3 whole peppers
Lemon peel (small piece)
½lb. of bacon
2 tablespoons of mushroom ketchup (optional)
½oz. of flour
½oz. of butter
1 teaspoon of salt
¼ teaspoon of pepper
Stock or water

(4 to 6 servings)

The animal should be freshly killed and skinned, cleaned, and jointed and then soaked overnight in cold water to which a teaspoon of salt has been added. Fry the bacon crisply and remove it from the fat. Dry the joints of meat, flour them, and fry them lightly in the bacon fat. Place the bacon cut small and the meat in a casserole, add the lemon peel and ketchup, and cover these with stock or water. Put the herbs, cloves, allspice, and whole peppers into a muslin bag and place this in the casserole, cover the mixture, and bake it slowly for 2 to 3 hours (hare will take longer). When the meat is tender take it out and strain off the onions, herbs, and lemon peel. Melt the butter, mix the flour with it, and stir this mixture into the strained liquid. Boil this sauce for 3 minutes and add a teaspoon of red currant jelly and the ketchup. A wineglass of port wine improves the flavour but is not essential. Serve the dish hot.

Pot-roasted Fowl

An old fowl unsuitable for roasting in the ordinary way can be made as tender and appetising as chicken by pot-roasting it in a casserole, and it requires practically no attention until the last ½ hour before it is served.

The fowl is prepared and stuffed as for roasting, but is placed in a casserole in which a little fat has been melted; a cup of water is added and the cover put on. The fowl is allowed to simmer very gently for 3½ to 4 hours or until the meat on the drumsticks feels tender when tested. The fowl is then removed to a roasting pan, basted well with fat, and cooked in the oven sufficiently long to brown attractively and crisp the skin. Care must be taken at this stage that the meat is not dried out, and it should be basted frequently. The liquid in the casserole makes a rich, well-flavoured gravy. Rabbits can be treated similarly.

Easily Made Eiderdown for Child's Cot or Bed

By EVELYN E. MOORE,
Field Officer in Rural Sociology, Department of Agriculture, Palmerston North

THE child's cot or bed cover described is made patchwork style of scraps of material or remnants, or if desired, from one or two larger pieces of material. As it is built up in sections, it may be made any suitable size and quite easily added to if, for example, it is desired to enlarge a cot cover for use on a child's bed or single bed. If the cover is made of scraps, and if fleece wool which has been scoured (by boiling with soap and washing soda) and teased out or kapoc from old pillows or cushions is used as filling, the cost is practically nothing, and yet the eiderdown can be warm, light, washable, and colourful.

THE eiderdown is made up, basically, of a number of miniature cushions, or bags, which are filled, stitched, and then joined by oversewing to form the quilt. Therefore, it can be made as a spare-time occupation. The cushions may be stitched by hand or by machine and oversewn together by hand, or by machine (if a zig-zag one is available).

Materials for Cover

As the final appearance and wearing quality of the cover will depend on the selection and combination of different materials, the following points should be considered.

First, materials should all be approximately equal in weight and wearing quality; if necessary, fabrics of different fibres may be mixed, if their appearance and washing qualities are similar; for example, rayons spun to resemble linen and cotton may be mixed with these. Fabrics chosen should be shrink proof, or pre-shrunk, and washable so that the cover will not be spoilt after the first washing.

Finally, if possible, the materials should be sorted (at least for the top of the cover) so that there are sufficient matching ones to form the outer border or to make some simple and definite pattern. For example, a dark or plain coloured material may be chosen for the outer border and alternate floral and plain materials used for the inner cushions, or materials may be shaded, graduating out from a central, light coloured bag.

Quantities of Material Necessary

Though quite a range of sizes and shapes of cover pieces are permissible, it is advisable not to use more than one or two sizes in each cover.

The pieces may be square, oblong, or a right-angled triangle. For covers for prams or small cots pieces should generally not be less than 4in. square; for cot covers or bed covers they should be at least 6in. square and may be up to 8in. or 9in. square. A useful size for oblong pieces is 7in. x 5½in. (All these measurements include turnings.)

Each bag or miniature cushion consists of two pieces (it is most important to cut exactly the same size all pieces which are to be fitted together). The two pieces need not match, nor for that matter need the two sides of the finished eiderdown; however, any pattern should be worked out beforehand and the bag halves seamed together accordingly. It is a good idea

EASILY MADE EIDERDOWN

Washed and teased wool used for filling the eiderdown, the pile of bags stitched and ironed ready for filling, and one of the bags or cushions being filled.

to draw beforehand on squared paper the size and design desired and the bag dimensions in which these can be best worked out, especially if a more complex pattern or a pattern for both sides of the cover is planned. For example, 25 bags 7in. x 5½in. will make a quilt measuring approximately 32in. x 24in. (depending on the depth of seam allowed). Seam allowances should, of course, be measured and made the same on each bag; otherwise there may be considerable discrepancies when the bags are to be sewn together. In the bag illustrated 30 8in. squares were made into cushions and joined in rows of three, which with ½in. seam allowances produced a centre cover 21in. x 35in. For the border two larger scraps were used and made into four bags of varying sizes, the end ones being 7in. x 22in. and the side ones 7in. x 49in., making in all a cover approximately 4ft. 1in. x 2ft. 11in., suitable for a small child's bed.

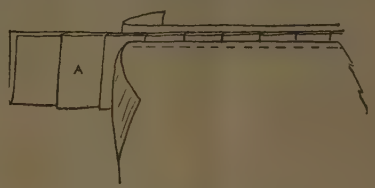
Making the Bags

Having worked out the pattern, machine the squares or triangles together in pairs, right sides together, leaving an opening on one side just large enough to enable the filling to be inserted. Turn the pieces right side out and press them flat. It is advisable to make all the bags required before starting to fill them, as they are more easily stored and do not get so easily crushed or crumpled. It is, of course, important to seam the bags accurately with true, sharp corners; otherwise they will not be easily stitched together.

The amount of filling to be used in each bag should be judged carefully, as warmth, not weight, is the aim. Bags certainly should not be more than half filled—an average estimate might be 1oz. to 1½oz. of kapoc, teased wool, or flock per bag. The raw edges of the open side are then turned in and slip stitched down.

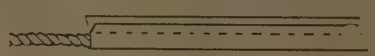
Finally the bags are oversewn together in the order selected to give the most effective pattern. It is perhaps easier if they are sewn together in strips of four or five, depending on the size the completed cover is to be. The strips are then oversewn to each other. Though this task is relatively slow compared with machine sewing, it can be conveniently done in spare time and is a relatively simple and easy, if slightly slower, method of making an eiderdown that may appeal to the inexperienced seamstress, as no special skill with the needle is required.

If desired, and especially if larger scraps or perhaps a ¼yd. remnant is available, a frill or piping may be inserted (as in the illustration) in the outside edges of the bags used for the border. Piping cord if used should be boiled, as it shrinks considerably. Piping should be cut about 2in. wide to cover the cord and it will fit better if it is cut on the bias, though frilling is cut on the straight of the material. It should be about 3in. wide. It is then folded in halves and pressed. For

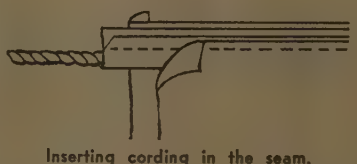


Inserting pleated frilling (A) in the seam.

frilling, pleats are pressed in, and the frilling is then inserted between the outside edges of the bag (see diagram) and pinned or tacked in place before stitching is done. Piping already prepared (see diagram) is inserted in the



Making cording.



Inserting cording in the seam.

same way. To obtain a professional effect it is advisable to use a cording or zipper foot, which is available for most makes of machines.

If the seams joining the tiny cushions seem a little uneven, they may be pressed flat over a roller (made by wrapping a towel round a piece of dowelling or a rolling pin) to avoid flattening the bags. The cover is then ready to use.

If a quilt with nursery rhyme prints similar to those shown in the illustrations is made, the alternate, plain squares can be embroidered with the letters of the alphabet or with various nursery rhymes. This should of course be done before the cover is made up.

Four bags have been filled and joined together by firmly oversewing the edges.

Culture of Gladiolus in the Flower Garden

Cathay is an informal, large-flowered gladiolus. The florets are arranged in a zig-zag fashion on the spike.

GLADIOLUS are among the most popular summer flowers in New Zealand gardens. Each spring they are planted in gaps in flower borders or a bed is filled with them. In this article J. P. Salinger, Horticulturist, Department of Agriculture, Wellington, describes their cultivation in the flower garden. The notes for work in the flower garden in March are by K. H. Marcussen, Horticulturist, Department of Agriculture, Christchurch.

GLADIOLUS are easy to grow and fairly trouble-free, and by careful timing can be made to bloom over a long period; they are extremely useful for decorative work in the home, both the spikes and the florets being of great value for this purpose.

The modern plant breeder has given gardeners a wonderful range of colours, shapes, and forms in this useful flower. A few years ago there were only two main types, the tall, large-flowered hybrids with wide-open flowers and the shorter, small-flowered or primulinus types with hooded flowers. Now there is a complete range of types varying in height from 1ft. to 3½ft. with open and hooded flowers set on the stems to face upward or downward, with sharply edged petals, or with ruffled edges.

The dwarfer varieties with smaller flowers are extremely useful for floral decoration, and anyone requiring plenty of flowers for decorating the home will find these of more value than the tall, large-flowered types for modern floral arrangements.

In the majority of gardens only the summer flowering varieties are grown, but several species or hybrids from the species could be grown more widely, as these types flower in winter and early spring, providing variety in colour and type of growth which is valuable at these times of year; the cultivation of these species will be described separately.

Use of Gladiolus in the Garden

The traditional way of growing gladiolus is to plant a long row of them in a bed or border to give summer flowers and cut blooms. This method is quite satisfactory if exhibition blooms are wanted, but for general garden decoration more imaginative uses can be found. As they flower once only and must be allowed to ripen naturally after flowering, they are not suitable for planting alone or for planting in a prominent position such as in a border lining the path to the front door or under standard roses. They will suit admirably if planted among herbaceous plants or if planted under summer bedding plants which will themselves grow up and make a good display afterward.

In a formal, large-flowered gladiolus such as Pfitzers Masterpiece the florets are set evenly on the spike and the petals overlap.

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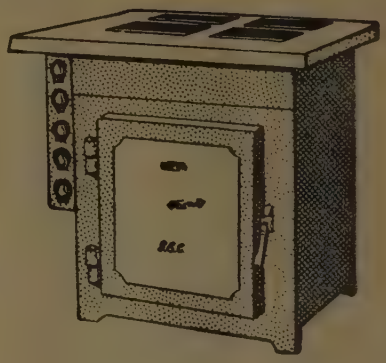

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Where gaps are left in herbaceous borders for bedding purposes gladiolus can be planted in the gaps and annuals sown over them. Many delightful combinations can be evolved: crimson gladiolus and white gypsophila, deep purple gladiolus and the blue cynoglossum, and orange gladiolus and mignonette. The annuals will be past their best by the time the gladiolus are ready to lift and the space can then be prepared for a display in spring. If the gladiolus have flowered early in the season, the tops may be cut off, below the level of the annuals, about 6 weeks after flowering.

In formal bedding schemes their use must be very carefully decided. Fairly tall bedding plants must be chosen to hide them after flowering. Petunias, African marigolds, and bedding dahlias would be satisfactory. They would look out of place, however, among fibrous begonias. In general, only one variety of gladiolus should be used. The corms should be planted in symmetrical shapes and balancing positions in the bed rather than scattered among the other plants.

For cut flowers they can be planted in long rows at the back of borders, about 1ft. in front of hedges, fences, or walls, or separately in the vegetable garden. For indoor decoration it is not essential that the spikes should be straight, and in positions such as these staking is seldom necessary. For exhibition the best possible soil and aspect should be chosen and protection from wind is important in the choice of the site.

The Gladiolus Corm

Gladiolus are normally grown from a type of storage organ known as a corm. The corm is really a very short, swollen stem and each season one or more new flowering corms and several very small corms called cormlets, cormels, or pips are produced from the old one.

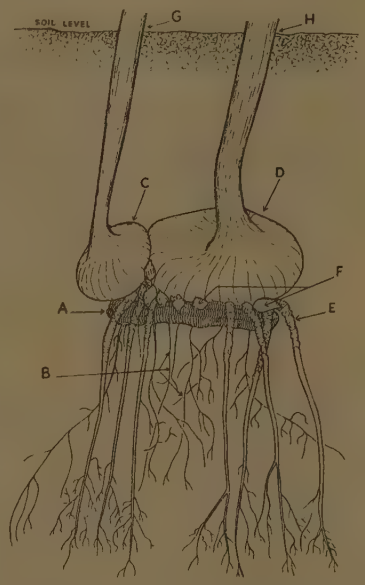
Even in mid-winter the corms are not dead; they are only dormant, and must be treated with care and attention. Though they might stand a certain amount of rough handling without severe damage, they should be treated gently as should all live plant material. They should not be dropped or bruised or stored under damp or very hot conditions.

Size of Corms

The size of the corms is determined by measuring the diameter. Sizes offered for sale retail in New Zealand range from 1in. to 2in. and above. Though many gardeners buy the bigger corms for general garden planting, the smaller sizes 1in. to 1½in. in diameter produce excellent spikes, but the bigger corms produce several spikes or one spike that may be too large and may become top-heavy. For all purposes in the garden the medium-sized corms provide the best spikes.

Corms smaller than 1in. in diameter sometimes do not flower, but build up to form one large- or two medium-sized corms during the growing season.

Except for the specialist gladiolus grower, cormlets are seldom worth retaining. They are best discarded during the cleaning up process in winter. Under good garden management stocks of gladiolus varieties increase steadily and cormlets need to be grown on for a year at least before they produce corms big enough to flower. Few gardeners have enough room or time to look after them for a full growing season, and unless they are managed as carefully as the flowering plants, they may become infected with disease and more than likely the stock will get mixed.



Gladiolus toward the end of the growing season. The corm originally planted (A) has shrivelled up, together with the feeding roots (B) which it originally produced. Two of the buds on top of the original corm grew into shoots (G) and (H), at the base of each of which a new corm has now developed (C) and (D). In addition, a number of small cormlets (F) are clustered at the junction between old and new corms. Thick fleshy roots (E), which grew from the base of the new corms, are now contracting (note the concertina-like effect at the top of each root) and are drawing the new corms down to the same level as the old one originally occupied.

Choice of Corms

The majority of gardeners buy their corms from seedsmen or from the gardening counter in large stores. A good corm should have the following features:—

1. Clean outer papery scale leaves enclosing at least the upper part of the corm.
2. Clean flesh without obvious dry-brown or black spots or depressions. It should feel firm, not spongy.
3. One or more growing points on the upper surface; these points should be less than ½in. long.
4. A clean circular scar on the base, with no more than a fringe of new roots appearing as white pin-heads around the scar.

Corms should not be purchased which show one or more of the following features:—

1. Tattered dry scale leaves covered with black specks.
2. Flesh showing distinct black or brown sunken areas; or the corm feels soft to the touch.
3. Growing points longer than ½in., or leaves already appearing; or a dry scar present where the growing point should be, showing that this has broken off.
4. Long white roots visibly growing out of the edge of the lower surface.

It does not matter that the corms are covered or sprinkled with dust or powder. This is probably DDT or a fungicide dusted on the corms by the grower to keep them free from pests and diseases.

The same standards should be followed by gardeners when they are examining their own corms in storage and before planting. After purchase, or if the corms are sent by post from specialist growers, the parcels should be opened on arrival. When they are not to be planted immediately they should be stored in a cool, airy garden shed or basement and not left in the sun on a windowsill or in a damp cupboard.

Plant's Life Cycle

The calendar gives an indication of the life cycle of a plant. If the various phases are understood, the reasons for the cultural operations can then be appreciated.

After Planting

One to 4 weeks: Roots produced from base of old corm. Growth develops from buds on upper surface.

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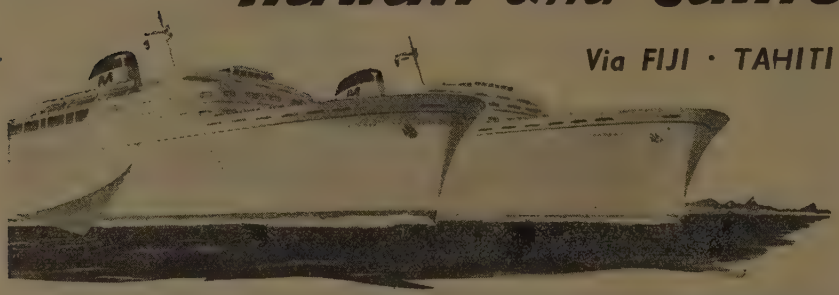

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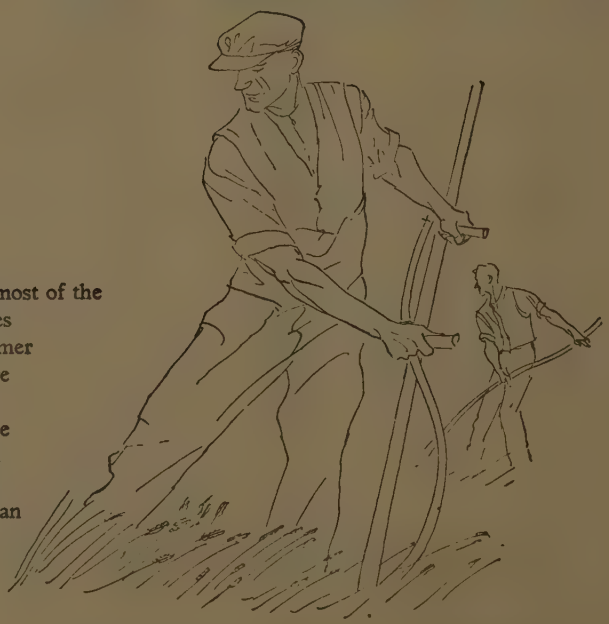

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Four to 7 weeks: New corm starts swelling. Other roots (contractile roots) develop between old and new corms. Flower bud develops in the leaves.

Seven to 13 weeks: Leaves grow. Flower spike extends. Thick root-like stems (stolons) develop between old and new corm with cormlets at the end.

Thirteen to 15 weeks: Flowering.

Nineteen to 22 weeks: Seeds set on flower stem, leaves go yellow then brown. Old corm dries up, new corm develops outer protective scale leaves.

Soil Preparation

Preferably gladiolus should be planted in a fresh position each year, and though they are very accommodating as to soil type, they will not tolerate excessive wet or dry positions. Apart from these extremes no special soil is required, but adequate manuring will be necessary.

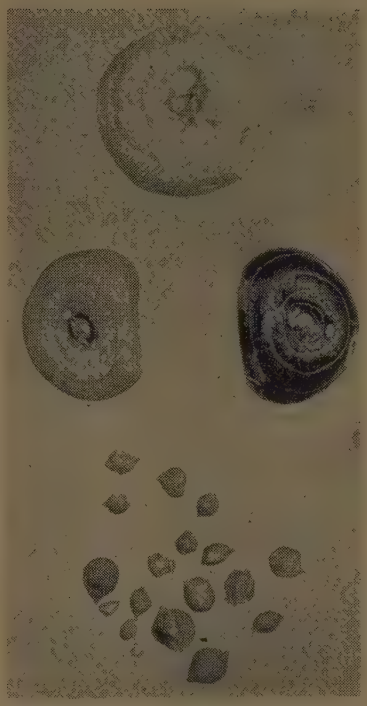
They grow very well on turfy soil that has been turned in the previous autumn, though they should be protected from attack by wireworms or grass-grub by dusting the soil with BHC (lindane) or DDT dust.

Other soils should be enriched by digging in well-rotted compost or animal manure. This should be applied in winter and well mixed with the planting soil, not left in a layer one spit down. Where gladiolus follows spring bedding plants such organic manure must be thoroughly rotted and in a fine powdery state if incorporated just before planting. In such cases it may even be better to work this into the topsoil after planting, where it will act as a mulch. A suitable fertiliser on turfy soil would be 2 parts by weight of blood and bone, 4 parts of superphosphate, and 1 part of sulphate of potash at 2oz. to the square yard.

On cultivated garden soil the application should be 3 parts by weight of blood and bone, 2 parts of superphosphate, and 1 part of sulphate of potash at 4oz. per square yard. Lime may be required on turfy soil, but only if this is known to be acid.

Based on the calendar given the planting date can be easily decided. The usual time is from the end of July to mid-October. However, if a long holiday is intended over the Christmas and New Year period corms planted mid-September to mid-October will probably flower during the holiday period. In this case planting should be carried out early in suitable areas or from mid-October to the end of November, and flowers will then be available when the gardener is at home.

Before planting, the corms should be dipped in a fungicide material, either an organic mercury disinfectant or a dusting material based on thiram. This will disinfect the corms against most diseases present on the surface of the corm, and will also protect them from soil-borne diseases.



Gladiolus corms (upper) and cormlets (lower). The flat side on the two lower corms is due to two or more corms developing from the parent one. Normally they should only have the outer skins (husks) completely removed just before planting.

The corms should be planted with 4in. to 6in. of soil above them, the shallower depth for the smaller corms. It should not be necessary to lay them on a bed of sand as recommended in publications overseas unless all the cormlets are required for further propagation. If the soil is wet and badly drained, it is unsuitable for gladiolus and most other bulbs, and the drainage should be improved before any bulbs are planted. When set out in rows the corms can be set 6in. apart, which distance is a useful guide when using them for bedding purposes.

Aspect

Though gladiolus is accommodating in its cultural requirements, certain positions should be avoided, such as very hot, dry areas found at the base of a north-facing wall or on the edge of a bank on light soil. Shaded areas such as beneath trees or between tall shrubs are also unsuitable, as the plants often "go blind", producing leaves but no flowers.

They can be grown on a south border provided there is plenty of light in every direction, but they will fail on the south side if they are shaded by other plants or overhanging buildings.

Cultivation

After planting, it is only necessary to keep the surface soil lightly stirred with a push hoe or tined cultivator to keep down weeds. As the growing points break through the surface, more care will be needed and hand weeding between the plants should be carried out. Weeds pulled by hand should be collected and composted; if left on the soil surface, they may seed before dying.

If they are planted in rows, the soil should be moulded up to form a ridge about 3in. high when the plants are about 12in. high; elsewhere this will not be possible, but even so no crust should be allowed to form on the soil surface.

Provided the soil was well manured before planting, little additional manuring will be needed. Extra-large spikes can be encouraged by watering with the soluble foliar fertilisers or with liquid manure made from farmyard manure. The foliar fertilisers are cleaner and easier to handle and are quite sufficient under good management.

Watering may be needed if a really dry spell occurs, especially when the plants are 12in. to 15in. high and the spikes are developing; a good watering should be given followed by a mulch of old compost or a thin layer of lawn mowings.

Sawdust also provides a good mulching material and should be applied immediately after planting or when the plants are 6in. high. An additional 4oz. to the square yard of blood and bone should be applied to the soil surface before the mulch is laid on.

Very fresh resinous sawdust such as that from macrocarpa may cause some bleaching of the leaves, but older composted sawdust is especially useful and will reduce the amount of weeding necessary. Sawdust from timber treated with wood preservatives should not be used, as it may contain materials harmful to plants and it will not rot down.

Staking

Provided gladiolus are deeply planted in a sheltered position, little staking is needed. Where these are needed to ensure straight spikes individual bamboo stakes should be used. Fresh bamboo is green and not unsightly, but broken packing case wood, bent manuka stems, and similar stakes are disfiguring and spoil the look of the plot.

A gladiolus plant ruined by thrips damage.

Long rows may be supported by stretching two wires along the length of the row at 4in. and 12in. height above soil level, and tying the spikes to the wire, twisting the tie round the wire twice before tying the plant.

Binder twine is a suitable tying material and may be dyed green before use by dipping in a green canvas preservative based on copper naphthanate.

When stakes are used one tie should be made at 6in. height and another round the spike between the second and third florets.

Routine Pest and Disease Control

Normally the only routine protective material which need be applied during the growing season is a spray against gladiolus thrips. Whether or not thrips damage is evident the plants should be sprayed as the season becomes warmer with DDT or lindane emulsion. Applied at 3-weekly intervals this spray will keep the plants free from this disfiguring pest throughout the season.

If clean corms were planted in fresh soil, there is little likelihood of disease developing. Occasionally a plant will become yellow or greyish white before flowering because of attack by a fungous disease. In such cases the whole plant should be dug out with a trowel and burnt to prevent the infection spreading. It is not possible to extract the whole plant by pulling at the leaves, as these will snap off above the corm and leave infected material in the soil. A fuller description of the commonly occurring troubles is given in a later section.

Cutting

When using the spikes as a whole, they should normally be cut in the morning when the first or second floret is opening; for other floral arrangements, single florets or the tips of older spikes may be used after the first flowers are faded.

It is essential to keep as many undamaged leaves as possible on the plant after the flower spike is removed, so that good, sizeable corms may be built up during the rest of the growing period.

A sharp knife should be used when cutting and two methods may be followed. If the knife has a sharp point, this should be thrust straight through the leaves and the spike, which can then be pulled out. Alternatively, the knife blade can be slipped down between the leaves close to the spike with the blunt edge downward. When the required length of stem has been reached an upward pull of the knife will sever the stem cleanly. After gathering, the ends of the spikes should be cut across cleanly and the stems deeply immersed in a straight-sided tin or vase for a few hours before being used for decorative work.

An adult thrips; its normal size is $\frac{1}{16}$in.

Cut spikes may be kept fresh and in usable condition for several days if stood in water in a cool, shady room. They should be kept as upright as possible, as they continue growing in water and if held at a slant in a container, the tip may continue to grow vertically at an angle to the rest of the spike.

After Care

When the plants have been allowed to flower for garden decoration and only the tips of the spikes cut for the house, or not cut at all, the plants will set seed. Except where plant breeding is carried out these seed pods should be removed, but the whole of the flower stalk left on the plant, if it is not unsightly.

Gladiolus breeding is a specialised form of gardening, and there is such a wealth of good varieties already available that the home gardener will not find it worth while carrying out crosses and growing the plants from seed, except as a hobby.

Harvesting

The plants are ready to lift about 6 to 8 weeks after flowering; by this time the leaves are beginning to turn yellow. Gladiolus should not be left until the leaves turn brown. A garden or border fork is the best tool to use for lifting and this should be inserted vertically into the soil about 4in. from the actual plant. The corms can then be levered out of the soil and all cormlets collected. The whole plant with leaves, flower stem, new corms, old corm, cormlets, and adhering soil should then be placed in a shallow box, preferably with separate varieties in separate boxes or at least with good partitions between varieties. The name of the variety should be written on the box, as labels sometimes get lost or mislaid.

Curing

The next step, curing, is most important. Under this treatment the old corm gradually dries off completely, and the new corms ripen and form a protective layer against fungous infection.

The essential feature of curing is the drying of the corms in a warm, airy atmosphere and not under cold or moist conditions. The ideal temperatures range from 65 degrees F. to 85 degrees F., and the higher the temperatures are the quicker the curing takes place; normally it takes 3 to 5 weeks. The relative humidity should be 80 per cent. or lower.

Various methods can be employed, but in all cases the corms should not be in layers more than four deep.

Suitable ways of curing are:—

1. Laying the boxes of corms on a glasshouse bench, under cloches, or in a cold frame. Slight ventilation should be provided to allow the evaporation of moisture.
2. The boxes can be set outside in the sun on fine days and the corms turned to ensure that all are exposed to the heat of the sun.
3. Laying the corms on a wire netting grid supported off the ground with a sheet of corrugated iron about a foot above the grid and sloping slightly to carry off the rain.
4. Tying in small bunches and hanging in an airy shed.

Cleaning

Curing is complete when the old corm can be easily detached from the new ones. The tops should be cut off and burnt together with the old corm, and the new corms cleaned of soil and cormlets. The brown outer husk on the new corms should be retained undamaged to protect the fleshy corm beneath.

Unless the varieties are especially valuable, it is seldom worth keeping the cormlets; under good cultivation the stocks should gradually increase, and if they decrease, this would be due to bad cultivation or disease. Under such conditions the cormlets may be no healthier than the parent plants.

At this time, too, the plot where the gladious were grown should be dug over again to make sure that no corms or cormlets have been missed, as the latter if left in the soil can be troublesome and cause varieties to become mixed, if gladiolus are planted in the same place within the next two seasons.

Storage

After cleaning, the corms should be dusted with equal parts of 5 per cent. DDT dust and 2 per cent. lindane dust to kill any thrips or aphides overwintering on them, and they should then be placed under good storage conditions. Ideally they should be placed in wire-bottomed boxes, but ordinary wooden boxes with slits for ventilation along the bottoms and sides are quite suitable. Corms can also be stored in old nylon stockings, for the essential features of storage are good air circulation and a temperature below 50 degrees F. Unsuitable places are damp sheds, cupboards near fireplaces, or tightly closed cardboard boxes.

Raising from Cormlets

Some of the best varieties of gladiolus increase slowly, and over a period of years a mixed collection of gladiolus may become unbalanced with too many poor types. If the home gardener wishes to increase the stock of special varieties, the cormlets should be carefully collected when the plants have been fully ripened (cured). The cormlets should be stored separately from the corms in a labelled container and in July and August they should be sorted through. It will be noticed that they are covered with a tough brown husk, and this must be cracked or split with a knife; otherwise it may check the growth of the young plants.

The cormlets should then be soaked for a week in water or better still a weak solution of organic mercury disinfectant. They can then be sown in drills about 2in. deep in a spare plot of ground, and if a layer of sand is spread on the base of the drill, it will be easier to collect all the corms at the end of the season.

They tend to germinate irregularly, so careful hand weeding will be required in the early stages. Routine attention to pest and disease control is required, and by the end of the season the larger cormlets will have built up into small flowering corms. It may take 2 years for the smallest cormlets to grow to flowering size.

Exhibiting Gladiolus

There are many types of gladiolus hybrids grown in New Zealand, and the larger garden types are known as "large flowered gladiolus". When studying schedules at flower shows exhibitors are often confused by the terms "formal" and "informal".

In a formal gladiolus each floret lies close to the stem and the florets overlap so that no stem or space is seen between one floret and the next. The florets should lie in two neat rows up the spike.

In an informal gladiolus the florets are set more openly on the stem so that the spikes in flower have a zigzag appearance.

Informal gladiolus are usually divided into classes ranging from giant to miniature, the size depending on the width of the florets. Normally the classes for all types of gladiolus are set out on a colour basis. A typical class in a flower show would read:—

"3 spikes—violet, formal variety" or "1 spike—smoky—small informal".

Primulinus Gladiolus

Primulinus gladiolus in general produce shorter spikes and smaller flowers than the large flowered types. Their distinctive feature is that the upper petal curves over the centre of the flower, giving a hooded appearance to the floret.

In many shows there are separate classes for primulinus; otherwise they may be shown in the informal or decorative classes.

Other Types

During recent years breeders have been raising gladiolus which are smaller and more varied than the large flowered types. Depending on the shape of the florets they are classified as "miniatures", "face ups", "ruffles", etc. These varieties are especially useful for mixed floral arrangements.

What is a Good Exhibition Gladiolus?

Judges at flower shows take particular notice of the following points in determining what is a good exhibition gladiolus:—

1. Florets facing all one way.
2. Florets evenly spaced along the stem.
3. Lower florets still fresh when the upper ones are open; a floret is fresh when each petal is firm, with a clean, bright margin.
4. Spike straight; the tip not bending in any direction.

Judges and successful exhibitors at shows will always be prepared to advise a newcomer why certain spikes were awarded a prize and why others failed. Discussion of these points will assist the keen grower to improve the cultivation and to show the blooms in the best possible manner.

Many horticultural societies are affiliated to the New Zealand Gladiolus Council (Inc.), which organises national shows in both islands each year and publishes a quarterly bulletin.

Gladiolus Species

Several gladiolus species are valuable as garden plants and could be grown more widely than at present. They are better suited for mixed borders than for bedding or formal display purposes. They flower before the usual garden types and are useful cut flowers in spring and early summer.

G. byzantinus is a hardy species with violet-purple flowers in early summer. It is propagated by division of the corms or from larger cormlets and these should be planted in late autumn, or early spring in cold districts.

G. colvilli grows to 1½ft. to 2ft. high and is available both as a white variety "The Bride" and a red variety *G. colvilli rubra.* The latter produces an arching spike of flowers which is suitable for certain types of decorative work. Corms should be planted from March to May or in very cold districts in early spring. They are hardy bulbs and will flourish in good garden soil. They do not require to be lifted each year.

G. nanus varieties are similar to *G. colvilli,* but are available as named varieties in a range of colours, pink, orange, and scarlet. They are propagated from corms. They are quite hardy and are available for planting in autumn in a well-drained open position.

G. psittacanus is less hardy than the preceding types, but is a valuable winter flowering plant for the milder areas. In growth it is like a watsonia and its orange-scarlet flowers are very effective in winter and early spring.

As this plant has a short resting period only, it should be planted from divisions of the clumps, in light soil, between October and early February. In frosty weather spikes should be cut before the buds open.

Identification of Troubles

1. Corms

(a) **Symptoms:** Black or brown spots on corm, brown sunken areas, brown rot spreading over the whole area.

Cause: Infection by one or more diseases known as hard rot, dry rot, and scab.

Control: On slightly infected corms the spots can be picked out with

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THERE'S AN AGENT IN YOUR AREA FOR SALES AND SERVICE

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the point of a knife and the corms dipped in fungicidal material. Prevention is important and four measures will assist in this.

1. Begin with clean corms.
2. As a routine treatment dip in fungicidal materials such as an organic mercury dip or thiram dust each year before planting.
3. Rotate the crop; change the areas where gladiolus are grown each year.
4. Cure the corms thoroughly after lifting.
5. Dust corms in store with thiram dust.

(b) **Symptoms:** Corms darker in colour than normal, surface rather rough and feels slightly sticky.

Cause: Thrips attack in store.

Control: Control thrips on flowering plants with routine sprays of DDT emulsion; dust corms before storage with equal parts 5 per cent. DDT and 2 per cent. lindane dust.

(c) **Symptoms:** Small grey insects clustered on corms and shoots.

Cause: Aphis infestation; aphis brought in from old flowering plants.

Control: Dust with lindane dust when storing.

(d) **Symptoms:** Centre of corm, especially basal scar, soft when pressed.

Cause: Botrytis rot (*Botrytis gladiorum*).

Control: As for other storage rots.

2. Leaves

(a) **Symptoms:** Plants rot off at ground level; leaves bleached and there is a brown stain at soil level.

Cause: Attack by one of the corm rots present either on the corm or in the ground at planting time (see under Corms).

Control: Dig out and burn infected plants.

(b) **Symptoms:** Tips of leaves die back and go yellow. Corms show brown rot.

Cause: Disease known as fusarium yellows.

Control: None known. Dig out and burn infected plants. Infection may spread in corms in store. Examine these regularly. Take preventive measures listed under Corms.

(c) **Symptoms:** Leaves show pale green or yellowish mottling. Flower colour often broken by dark stripes. In white, cream, and yellow varieties the flowers usually have pink stripes.

Cause: Virus disease called pea mosaic virus. This is present all over New Zealand; affects all legumes; also causes "streak" or "stripe" of sweet peas. Spread by aphis.

Control: Control aphis by spraying regularly with DDT emulsion or lindane. Once plants are infected they will not recover. Control aphis in store by dusting corms with equal parts 5 per cent. DDT and 2 per cent. lindane dust.

(d) **Symptoms:** Leaves show grey or silver streaks and flower buds are streaked. Flowers may be malformed and fail to open.

Cause: Attack by gladiolus thrips.

Control: Spray plants regularly in warm weather with DDT emulsion; dust corms in store with equal parts of 5 per cent. DDT dust and 2 per cent. lindane dust.

Note: Gladiolus thrips (*Taeniothrips gladioli*) is a minute insect; the immature stages are light yellow and the adults are black; they cluster between the leaf sheaths and in the unopen flower buds, and move quickly when disturbed.

(e) **Symptoms:** Small slow-moving greenish insects on spikes, which seem sticky to the touch.

Cause: Aphis infection.

Control: Routine spray with DDT emulsion and dust corms in store with equal parts 5 per cent. DDT and 2 per cent. lindane dust.

Note: These aphides spread the virus diseases.

(f) **Symptoms:** Small brown spots with reddish centres on leaves in damp weather. Spotting and malformation of flowers.

Cause: Botrytis disease; may arise from corms.

Control: Spray with thiram or ferbam fungicide. Dust corms in store with thiram dust.

3. Flower Spikes and Flowers

(a) **Symptoms:** Crooked stems and short, stubby spikes.

Cause: Various; insufficient water when spike developing, damaged root system; infection by thrips or virus disease.

Control: Check for pests and diseases first; if none found, consider cultural operations.

(b) **Symptoms:** Plants produce healthy leaves but fail to flower.

Cause: "Blindness" due to planting in too shady a position, storing corms too long and planting late.

Control: Plant gladiolus in open position, within a reasonable period, before the shoots have grown out.

(c) **Symptoms:** Flowers streaked and blotched, appear dried out, top buds fail to open.

Cause: Often called sunburn, is actually severe thrips attack.

Control: Spray plants regularly in warm weather with DDT emulsion; dust corms in store with equal parts of 5 per cent. DDT dust and 2 per cent. lindane dust.

(d) **Symptoms:** White streaks and blotches on the flowers of coloured varieties.

Cause: Virus disease, cucumber mosaic virus. This virus attacks a great range of plants and weeds; in a home garden there is probably a permanent source of infection from daphne, anemone, tree tomato, and passion fruit. It is spread by aphis.

Control: Rogue out and burn infected gladiolus; this disease is serious on tomatoes, marrows, etc. Control aphis by routine spraying with DDT or lindane emulsion.

(e) **Symptoms:** In coloured varieties petals show bands of deeper colouring.

Cause: Pea mosaic virus.

Control: Rogue out and burn badly infected plants; control aphis by spraying with DDT or lindane emulsion.

One other problem often puzzles home gardeners. In mixed plantings of gladiolus white flowered varieties tend to dominate after a few years. This is not due to "sporting" by other varieties, but is caused by the fact that many white varieties produce a prolific crop of corms; they also tend to flower earlier than many coloured varieties and so are more obvious early in the season.

Flower Garden in March

Though the weather in March can be very warm, the change of season is apparent and in southern districts there can be early frosts. Most plants have restricted growth during winter and from now on few plants growing in the open should be encouraged to make vigorous growth. Feeding with liquid manure should be discontinued to allow the plants to harden up, except if they are to be harvested before they can be damaged by frost. Feeding of chrysanthemums, for example, can be continued until the flower buds show colour.

Bedding plants for winter display should be planted out without delay or they will probably not come into flower before spring.

Caterpillars may still be very troublesome, but can be controlled with applications of DDT. Aphides may also be numerous and lindane should be applied for their control wherever it is necessary.

FLOWER GARDEN . . .

Border Plants

Many herbaceous perennials will now be at their best and except for Michaelmas daisies and late flowering delphiniums, the golden and bronze shades will be predominant; they do, however, tone well into the landscape while the deciduous trees are changing colour.

While the border is still colourful thought should be given to any changes that may be required in the planting scheme. When the herbaceous perennials have died down it is difficult to remember which of the plants were out of place because of the colour combination, height, or flowering period. Such observation should be marked and the alterations will more easily be done when the border is being renovated at the end of the season.

Bulbs

Spring flowering bulbs should be planted this month if they are not already in the ground. When planting is left until late in the season development of the shoots will take place, but as there are no roots to sustain this growth, all nourishment must be drawn from the bulb to the detriment of the subsequent plant. The leaves and complete flower are already formed inside the bulb at planting time. Details of preparation of soil and planting of bulbs were given last month.

Many liliums will now have finished flowering. Some may require transplanting, because they have become crowded in their position or bulbs may be wanted elsewhere. The best time to lift lilies is just when the leaves and stems have dried off, as the bulbs are then more dormant than at any other time. Because of this lack of complete dormancy, special care should be taken that the bulbs do not dry out; even the roots should be kept alive if possible. The depth the bulbs were growing at should be noted so that they can be replanted at the same level.

Lawns

Sowing of new lawns is best done in autumn and should be done early enough for the seedlings to become established before frosts cool the soil. The fine grass seeds germinate in about 3 weeks and this should be kept in mind when the sowing date is being decided on, for the plants should make sufficient growth before they are checked by cold weather. In this way a good sward is assured the next summer and weed growth will be at a minimum.

March is the best month for sowing in most districts and sowing should only be held up if a drought is experienced, making the seed-bed too dry for germination.

[Photo News

A well-kept lawn is an asset to any garden and repays the attention needed to keep it in good condition.

If the seed-bed has been prepared as described last month, sowing can be done whenever the weather is favourable. If the ground is thoroughly moist when sowing takes place, watering will seldom be necessary before germination.

A dressing of superphosphate should be given before sowing at 1oz. per square yard. After the seedlings are well through a light dressing (½oz. per square yard) of sulphate of ammonia will be of great benefit.

If grass-grubs and subterranean caterpillars are known to be troublesome in the district, an application of DDT should be made at 1oz. (50 per cent. preparation) per 40 sq. yds. This is easiest applied together with the superphosphate and will give control for several years.

A seed mixture for a fine-textured lawn is 2 parts by weight of chewings fescue and 1 part of browntop, which should be sown at ½oz. to 1oz. per square yard. For lawns where harder wear is expected ½ part of crested dogstail can be added to the mixture. Crested dogstail will assist the establishment of the finer grasses, but it is not as hard to mow nor as dominating as ryegrass.

For areas with very light soil or where droughts are frequently experienced yarrow or clover can be included in the mixture and will assist in keeping the lawn green in summer. Only a small proportion of these is necessary; 1 part to 20 or 30 of the mixture is sufficient.

For Auckland districts the fine-textured grasses are not very satisfactory and paspalum lawns are often used. Paspalum should be sown early, as higher temperatures are required for germination, but moisture must be plentiful. As the rate of germination is generally very poor, sowing should be at 3oz. per square yard.

Grass seed should be covered by a light raking after sowing, but it is best not to roll until a few days before the first mowing. If the seed-bed is left slightly rough, it will not cake on the surface and any rain falling will penetrate without washing the seed away.

Cuttings and Layers

Any plants which have been propagated by cuttings or layers during this season should now be planted out if root development has been satisfactory. If some do not appear strong enough to be planted out this month, they are better left in a nursery bed or reserved area where they can be given better attention during winter. Planting out can then be done in spring.

Many woody plants can be propagated by hard-wood cuttings, especially when taken early. Rose cuttings, for example, are often put in at pruning time and look very promising for a while, but after a month or two the newly formed shoots wither and the whole cutting dries up. It is natural for the buds to break into growth at the end of winter and even if the cutting has no roots, the shoots will exist on the sap of the stem until that has been used up.

Cuttings taken in autumn when the plants are going into dormancy will develop roots before the buds break and propagation should be more successful.

Hard-wood cuttings should be 6in. to 8in. long taken from vigorous shoots. The base should be trimmed just below a bud or leaf mark and the top just above a bud. They should then be inserted firmly to three-quarters of their length in a well-drained position.

Wrenching

Evergreen trees and shrubs cannot be transplanted as readily as deciduous ones, because the leaves function and transpire all the time. Special preparations for transplanting should therefore be carried out and wrenching is the term given to this operation.

The roots should be cut a short distance from the plant; no further away than the plant can be lifted with the whole remaining clump of soil. This is done by driving a sharp spade into the ground all round the plant, forcing it under as well to sever the bottom roots also. The plant should then be firmed into position again by a light tramping and if the weather is dry, a good watering will be beneficial. Occasional overhead watering during the first week or two will also assist the plant if strong sunshine or wind is experienced.

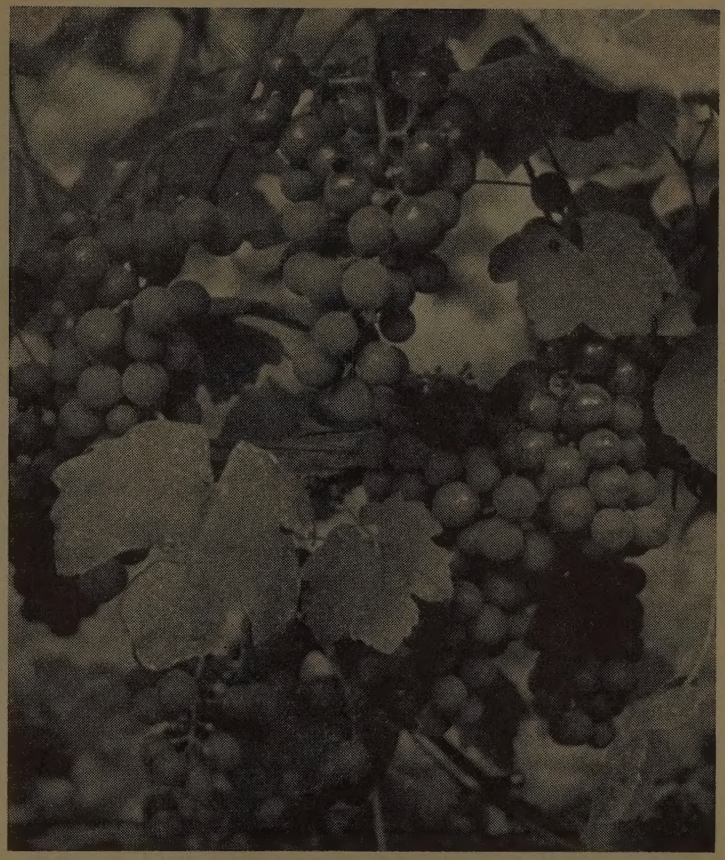
Wrenched plants will transplant later on with very little check.

Grape Preserves and Desserts

By BETTY M. JOHNSTON,
Field Officer in Rural Sociology,
Department of Agriculture, Wellington

THOSE who live in a grape-growing district and home gardeners with vines that on occasions produce bumper crops often fail to make the most of surplus harvests. Grapes are undoubtedly best eaten raw, but they may also be cooked in jams, conserves, and desserts and be used Continental fashion to garnish cold fish.

THE following recipes are some of the ways in which garden-grown grapes may be used. Hot-house grapes are usually too expensive to use for cooking.



[*Sparrow*

Preserves

Grape Juice

6oz. of grapes
8oz. of sugar
Boiling water

Wash the grapes and pack them into thoroughly clean, heated jars. Add the sugar and carefully fill the jars with boiling water. Seal the jars tightly. No processing is necessary and the juice may be strained and used after 6 weeks.

Grape Jelly

Proportions: 1 cup of boiled grape juice to ¾ cup of sugar.

Wash the grapes and remove the stalks. Add ½ pint of water to each pound of fruit. Simmer the fruit until the skins are soft. Strain the juice in a jelly bag, being careful **not to squeeze the bag.** Boil the juice for 10 minutes, then add the sugar. Boil the fruit juice and sugar until a jell is formed when a little of the mixture is poured on to a cold surface. Pour the hot jelly carefully into hot, clean jars and seal them with melted paraffin wax or with transparent cellulose.

Grape Butter

For this recipe 2 cups of mixed sieved apple and grape pulp and 2 cups of sugar are required (the pulp left over from jelly making may be used instead of freshly cooked pulp).

Boil the pulp and sugar together, stirring the mixture constantly to prevent scorching. The butter is cooked when it "sheets" from the spoon. Pour the hot butter into clean, hot jars, which should be sealed immediately.

"Sheet" test: Lift a full spoon from the mixture, hold it about 12in. above the saucepan, and pour the contents back into the pan. When the butter is cooked a "sheet" or skin will form which will fall away from the edge of the spoon, leaving the spoon clean.

Grape Jam

Clean and wash 4lb. of black grapes. Crush them in a saucepan and bring the pulp to the boil. With a finely meshed sieve collect the pips as they rise to the surface of the boiling fruit. When the skins are soft measure the pulp. Add 1½ cups of sugar to each cup of cooked grape pulp and cook the jam until it sets when a small quantity is dropped on to a cold surface. Pour it into clean, hot jars and seal them immediately.

Grape and Nut Conserve

2½ pints of bottled grape juice
6 finely chopped oranges (flesh and skin)
6 measuring cups of chopped raisins
Grated rind and juice of 2 lemons
3lb. of sugar

Cook all the ingredients together. When the mixture is thick add 5 measuring cups of chopped walnuts (½ cup of chopped hazel nuts may be added if desired). Pack the conserve into clean, hot jars and seal them immediately. This recipe yields about ten 1lb. pots of conserve.

Desserts

Stewed Green Grapes

½lb. of firm, green grapes
1 cup (8oz.) of water
2 tablespoons of sugar
Grated rind of 1 lemon
Small cinnamon stick (powdered cinnamon would spoil the appearance of the fruit)
Pinch of salt

Make a syrup of the sugar and water. Add the lemon rind, cinnamon stick, and salt. Add the washed grapes. Bring the fruit to the boil and simmer it for about 2 minutes.

The fruit should not be allowed to break up.

Green Grape Mould

1lb. of unripe grapes
1½ pints of water
6oz. of sago
Sugar to taste
Pinch of salt

Boil together all the ingredients except the sago. When the pulp is soft rub it through a fine sieve and return it to the saucepan. Add the sago and simmer the mixture until it is thoroughly cooked. Sweeten according to taste. Two lightly beaten egg yolks may be added to the hot pulp at this stage and, as the mixture cools, the stiffly beaten whites may be folded in. Pour the pudding into a mould or into individual moulds and allow it to set. Serve the mould garnished with whipped cream and peeled grapes. If the mould is turned on to a large platter, it may be surrounded by small grape leaves.

Grape Mousse

1 cup of grape jelly
2 cups of whipped cream
1 teaspoon of lemon juice

Fold the pulp and lemon juice into the whipped cream. Pile the mousse into a freezer tray and refrigerate it for 2 to 4 hours or until it is firm.

Grape Meringue

Sponge fingers
Thick custard made with 2 egg yolks
Stewed grapes
2 egg whites
4 tablespoons of sugar

Line an ovenproof glass dish with the sponge fingers. Pour a thick layer of custard over them. Drain the grapes and arrange a thick layer of them on the custard. Beat the egg whites stiffly, folding in the sugar a spoonful at a time. Pile the meringue mixture on the grapes and heat the dish in a moderately hot oven (375 degrees F.) for 10 minutes or until the meringue is faintly brown. Thicken the grape juice with cornflour and serve it as a sauce with the grape meringue.

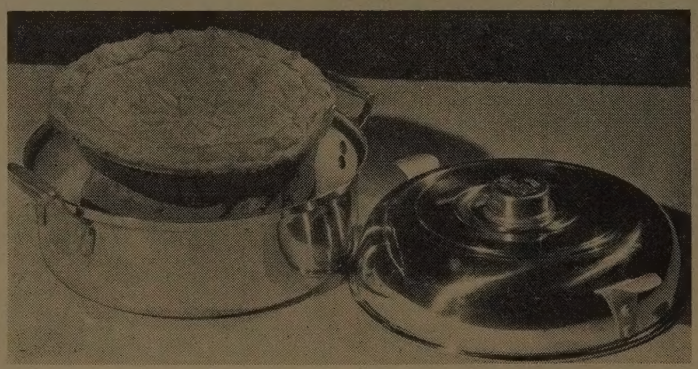
Grape Cocktail

Mix 2 cups of chilled grape juice and 3 tablespoons of chilled lemon juice. Frost cocktail glasses by dipping the rims first in lemon juice and then in sugar. Add a pint of ginger ale to the chilled juices and pour the cocktail into the frosted glasses.

Frosted Grapes

Dip small clusters of grapes into slightly beaten egg white. When they are nearly dry shake castor sugar over them. Serve them as a dessert or with coffee.

How to Keep Picnic Dishes Hot



THOUGH bacon and egg pie and pastry savouries may be popular picnic dishes whether served hot or cold, possibly the majority of families, if given the choice, would prefer them hot. With a little forethought this may readily be achieved.

Heat a brick for an hour in the oven (while the other dishes are being baked if desired), and then put it in a large container such as a roaster. Place the pie or savoury dish on the brick and cover the container and pack it. The dish will keep hot for 3 to 4 hours.

—EVELYN E. MOORE, Field Officer in Rural Sociology, Department of Agriculture, Palmerston North

Cleaning Mottled Felt Carpeting

FLOOR coverings because of their situation collect all types of spots and stains. Mottled felt carpeting is somewhat peculiar in that stains show up clearly, but the lighter patches left when stains are cleaned are not noticeable on the mottled surface. Provided the stains are not caused by a dye such as red ink, they can be removed without much trouble.

A bowl of hot water mixed with detergent, a small scrubbing brush, a bowl of clean warm water, and several clean dry rags are required for cleaning mottled felt carpeting. Dip the brush lightly in the detergent solution and scrub the stain vigorously until the mark has been removed. Wipe off the lather with a cloth wrung out of the warm water, then dry the area as much as possible by rubbing it with a clean cloth. The rinsing with warm water may have to be done two or three times to remove all traces of lather. Avoid walking over the cleaned patches until they have dried thoroughly.

It is advisable to use this method only with felt that is firmly tacked down.

—MAUD B. STRAIN, Field Officer in Rural Sociology, Department of Agriculture, Dunedin

Book Review

"Me and Gus Again": F. S. Anthony and F. Jackson

ME (Mark Hendrick) and Gus (Tomlins), neighbouring Taranaki farmers, have already made many friends. "Me and Gus" has sold 14,000 copies and "More Me and Gus" 10,000 copies. In the new book comic disasters follow each other in the same rib-tickling way that has come to be expected of these two characters.

The humour of the book is not intellectual or complicated. That is the pleasure of it. Mostly the characters and the situations are ordinary, but the smallest departure from normal, often an idea from the brain of Gus, is enough to upset them and they become hilariously abnormal.

The book is a series of self-contained incidents under separate headings. For each of them Nevile Lodge has given his impression in drawings that have the same light touch as the text. Whether Mark is draining his swamp, taking the new school teacher to a dance, or encountering a knife-throwing Oriental, there is never a dull moment. *—O.N.T.*

A. H. and A. W. Reed. 9s. 6d.

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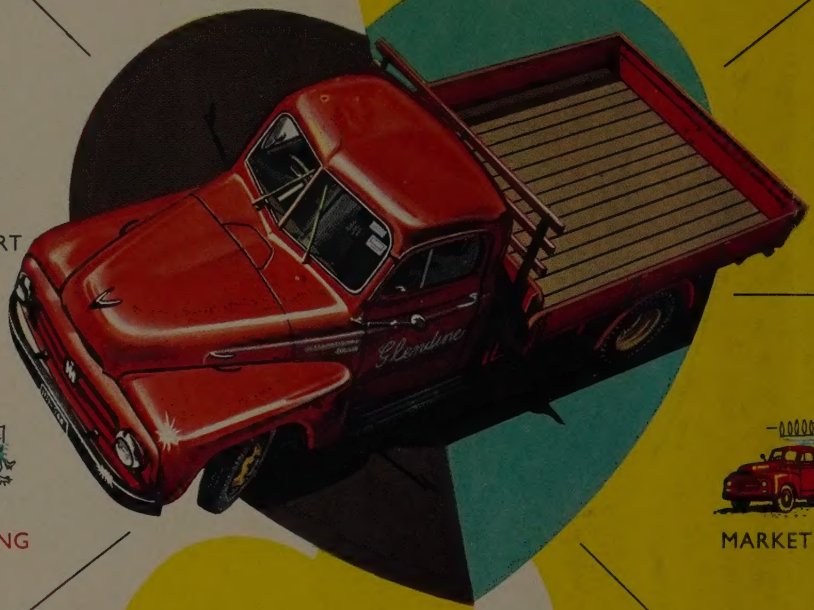

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